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~~UTILIZATION~~ -- VOL. ~~XXV~~ 6

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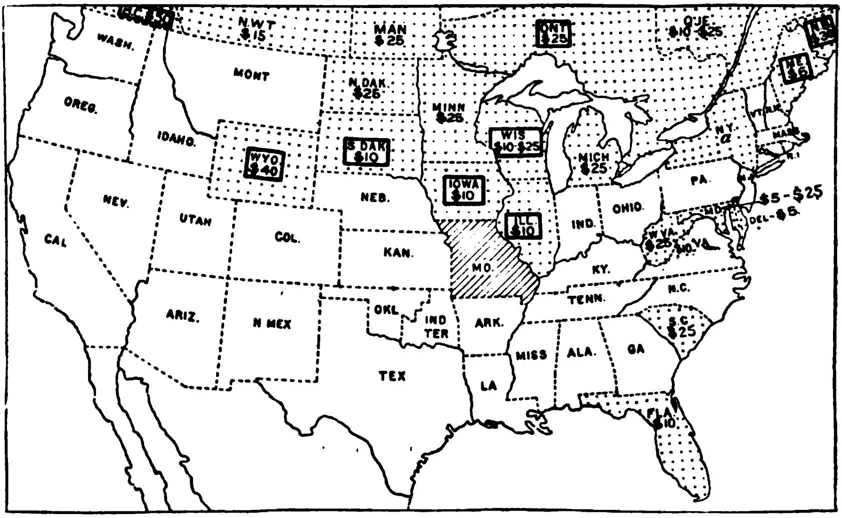

FIG. 1.—STATES HAVING NONRESIDENT LICENSE LAWS IN 1900.

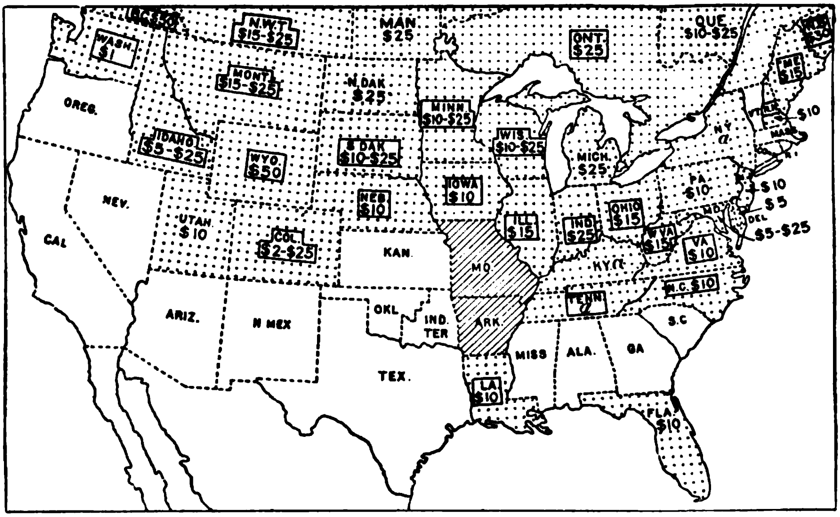

FIG. 2.—STATES HAVING NONRESIDENT LICENSE LAWS IN 1904.

MAPS SHOWING PROGRESS IN NONRESIDENT LICENSE LEGISLATION.

Inclosed names indicate States which grant special privileges for taking out a limited amount of game. States which are ruled do not permit hunting by nonresidents.

Walter Mulford
1905

U. S. DEPARTMENT OF AGRICULTURE

BIOLOGICAL SURVEY—BULLETIN No. 19

C. HART MERRIAM, Chief

Walter Mulford

HUNTING LICENSES

THEIR HISTORY, OBJECTS, AND LIMITATIONS

BY

T. S. PALMER

ASSISTANT IN CHARGE OF GAME PRESERVATION

WASHINGTON
GOVERNMENT PRINTING OFFICE
1904

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF BIOLOGICAL SURVEY,
Washington, D. C., August 20, 1904.

SIR: I have the honor to transmit herewith, as Bulletin No. 19, a report on "Hunting licenses, their history, objects, and limitations," prepared by Dr. T. S. Palmer, assistant in charge of game preservation. The object of this bulletin is to render generally accessible the information collected by the Department on the subject of resident and nonresident licenses. In States which have adopted the license system statistics regarding hunting not previously collected are now available. Thus the figures here presented show that during 1903 the receipts from licenses exceeded $10,000 in each of 9 States, and Illinois and Wisconsin each collected nearly $100,000; the total number of hunters in 10 States which license both residents and nonresidents exceeded 261,000; and the States which attracted most nonresident hunters were Maine, North Carolina, and Wisconsin.

Respectfully,

C. HART MERRIAM,
Chief Biological Survey.

Hon. JAMES WILSON,
Secretary of Agriculture.

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HUNTING LICENSES: THEIR HISTORY, OBJECTS, AND LIMITATIONS.

INTRODUCTION.

Two of the most important problems of practical game protection are how to enforce the laws and how to secure the funds necessary for the purpose. Without funds it is manifestly impossible either to provide or maintain the service required to carry the laws into effect; and if no serious effort is made to secure compliance with the law public interest in game protection flags until it becomes difficult to secure either appropriations or such legislation as will yield revenue for warden service. The most successful method of raising funds thus far devised is a system of licenses which in effect amounts to a direct tax on those who hunt. Several States depend almost entirely on some system of this kind for maintaining their warden service, and others receive from it important additions to their game protection funds. How important such a source of revenue may become can readily be appreciated from the fact that during the past year Maine collected license fees amounting to more than $25,000, Wisconsin $90,000, and Illinois nearly $100,000. In some States this money is derived principally from resident, in others from nonresident, licenses.

The requirements in regard to fees and the method of obtaining licenses differ widely in different sections of the country, and every sportsman who resides in a State which has license laws or who visits States where licenses are required is directly affected by the system. As interest in the subject is widespread, it seems desirable to bring together data showing not only the origin and development of hunting licenses, but also their advantages and disadvantages. Few questions in game protection have attracted more attention in recent years, and none, perhaps, has been more fruitful of discussion or led to more diverse opinions.

HISTORY OF HUNTING LICENSES.

It is commonly supposed that the license feature of game protection, which by many is regarded as unnecessary and unjust, is a recent development; but, although most of the present laws have been enacted during the last ten years, even a hasty review of the subject will show that the system originated at a very early date in the United States,[a] and was in reality an outgrowth of a discriminating attitude toward nonresidents. Hunting licenses were required in some of the colonies, particularly Virginia, more than two hundred years ago, though their object was somewhat different from those of modern times. One of the earliest statutes may be found in "An act for a free trade with Indians," passed in Virginia in April, 1691 (3 Hening's Stat., 69), the object of which was stated as follows:

> And for the future prevention of such mischeifes as have frequently happened at huntings, commonly called fire huntings and other huntings remote from the plantations, *Bee it enacted by the authority aforesaid, and it is hereby enacted,* That no person or persons whatsoever shall hereafter presume to goe an hunting remote from the English plantations without first having obtained the lycense and permission of their Majesties leiutenant governour or commander in cheife for the time being and the councell of state under such restrictions, limitations and conditions as at the time of giveing such permission shall be by them thought fit to be enjoyned and appointed·

DISCRIMINATION AGAINST NONRESIDENTS.

In an act passed on March 27, 1719 (Nevill, 86), nonresidents in New Jersey were prohibited from taking oysters or putting them on board a vessel not wholly owned by a resident. The discrimination against nonresidents in the matter of gathering oysters thus begun nearly two centuries ago has been maintained to the present time by oyster laws similar to the act of 1719 passed in 1820, 1846, and 1899. A similar discrimination may also be found in an act passed in Rhode Island in 1844.

In the second game law enacted in North Carolina (Laws of 1745, Chap. III) all persons not possessed of a settled habitation in the province were required to have a certificate that they had planted and tended 5,000 hills of corn before they were permitted to hunt deer. Section 4 of this act reads:

> That every person who shall hunt and kill deer in the King's waste within this Province, and who is not possessed of a settled habitation in the same shall be obliged to produce a *certificate* when required of his having planted and tended five thousand corn-hills, at five feet distance each hill, the preceding year, or season, in the county where he shall hunt, under the hands of at least two Justices of the Peace of the said county and the hand of at least one of the churchwardens of the Parish where such person planted and tended such corn, as aforesaid.

This law, which contains the germ of the hunting license, was amended twenty-three years later (Laws of 1768, Chap. XIII) so as to deny the privilege of hunting deer to persons not having a freehold of 100 acres of land in the province, or not having tended 10,000 corn hills during the previous year.

---

[a] It is sometimes said that the license idea originated in Canada, but this is not strictly the case.

In 1840 Virginia prohibited nonresidents from hunting wild fowl on beaches or marshes below the head of tide water, and maintained this restriction until 1903. In 1846 New Jersey made nonresidents liable to a fine of $15 and forfeiture of their guns to the informer for trespass with a gun, while residents convicted of the same offense were liable merely to a fine of $5 and costs, or less than one-third the penalty imposed on nonresidents.

In 1854 North Carolina prohibited nonresidents from hunting wild fowl in Currituck County, assigning the following reasons in the preamble of the bill:

> Whereas, large numbers of wild fowl collect during the fall and winter, in the waters of Currituck County, which are a source of great profit to the inhabitants thereof; and whereas, persons from other States, not residents of this State, shoot and kill, decoy and frighten the same, to the great annoyance and detriment of the citizens of our own State: Now Be it enacted, etc. (Laws of 1854, chap. 55.)

Under this act all persons who had not resided in the State for at least twelve months were prohibited from hunting or killing wild fowl in the waters of Currituck County. Recently in North Carolina and Virginia nonresidents hunting wild fowl in certain counties have been prohibited from shooting from sink boxes or boats, in order that this privilege might be reserved for residents alone.

By an act of December 11, 1858, Georgia prohibited nonresidents from hunting or fishing within the limits of the State, in order, it was said, to prevent strangers and others from holding conversation with slaves. Delaware in 1863, following Virginia's example, made it unlawful for nonresidents to kill wild ducks, geese, or other waterfowl on any of the marshes or waters of the State, under a penalty of $50 to $100. Three years later Florida, by act of June 13, 1866, prohibited nonresidents from camping or fire hunting, with or without dogs or guns, in Taylor and Lafayette counties. In 1880 Maryland prohibited nonresidents of the five counties bordering the Patuxent from shooting snipe, rail, and wild fowl on the waters or marshes of the river, and prohibited use of sink boxes in Queen Anne County by nonresidents of the county. Several similar instances of discrimination appeared in subsequent legislation of the State, and culminated in 1890 in a provision prohibiting nonresidents of Parsons Creek, Church Creek, and Neck districts, in Dorchester County, from shooting wild fowl on Little Choptank River.

The West and South have made even more severe discriminations against the nonresident. Missouri, in 1877, prohibited nonresidents from hunting game for market, and two years later prohibited them from hunting at all within the State, a provision which still remains in force. Similar action was taken by Wyoming about 1886, but the absolute prohibition then established was changed in 1895 to a $20 nonresident license. In 1879 Tennessee prohibited nonresidents from hunting deer for profit in certain counties, and in 1889 prohibited all hunting by nonresidents in certain others; but these provisions were replaced by license provisions in the general game law of 1903. Absolute prohibition has recently found favor in one or two other States. It was adopted by Louisiana in 1902,[a] and by Arkansas (except in Mississippi County) in 1903. Louisiana, however, substituted a license fee in 1904; so that at present Missouri and Arkansas are the only States which deny the nonresident the privilege of hunting within their borders.

NONRESIDENT LICENSES.

The history of nonresident license legislation may be conveniently divided into three periods, which overlap one another: (1) Development of the local license, beginning in 1872; (2) development of the market-hunting license, beginning in 1875; and (3) development of the general license, beginning in 1878.

LOCAL LICENSES.

The local license had its rise in the Eastern States. The first law containing a nonresident-license provision was apparently that passed in 1873 in New Jersey, under the title, "An act to incorporate the West Jersey Game Protective Association." (Acts of 1873, chap. 470, p. 553.) This association was incorporated for fifteen years, and section 7 of the act of incorporation provided:

> That if any person or persons nonresidents of this state, shall kill, destroy, hunt, or take any doe, buck, fawn, partridge, moor fowl, grouse, quail, or woodcock, at any time within the counties of Camden, Gloucester, Atlantic, Salem, Cumberland and Cape May in this state without complying with the bylaws of this Game Protective Society then the person or persons so offending shall forfeit and pay the sum of $50 each, for each and every offence * * * provided nothing in this Act shall prevent residents of this state from taking game or fish, subject to the existing laws of this state.

The membership fee was fixed at $5 for the first year and $2 per year thereafter, and nonresidents were required to procure membership certificates before hunting in the six counties above mentioned. These certificates thus became in effect nonresident licenses. In 1878 a somewhat broader general act was passed (Laws of 1878, chap. 184), applicable to other associations in New Jersey. The Delaware Game Protective Association was incorporated by act of legislature in 1879 along much the same lines. Its membership fees were the same as those of the West Jersey Game Protective Association, and nonresidents wishing to hunt in the State were first required to secure certificates of membership. (Laws of 1879, chap. 111.) The same idea was later adopted by the counties on the eastern shore of Virginia, through the passage of a law in 1894 requiring nonresidents of the State to become members of the Eastern Shore Game Protective Association before hunting wild fowl in these counties. The by-laws originally fixed the initiation fee of members at $1 and the annual dues at $1, but in 1901 the license fee required of nonresidents was increased to $10, the rate adopted by the State in its general license law two years later.

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[a] The police jury of Caddo Parish, La., in 1896, however, passed a measure prohibiting hunting by nonresidents in that parish. (Forest and Stream, XLVII, p. 386, Nov. 14, 1896.)

In 1875 Florida adopted a statute (Acts of 1875, chap. 2055, p. 62) making it unlawful for any nonresident to hunt for the purpose of conveying game beyond the limits of the State without first obtaining from the clerk of the county in which he proposed to hunt a license at a cost of $25. In case several persons hunted together, six could be included under the same license on payment of an additional $5 each.

In 1882 Maryland laid the foundation of a county license system by requiring nonresidents to secure licenses to hunt game in Caroline County; and in 1886 established a like requirement in the counties of Anne Arundel, Baltimore, Kent, Prince George, Queen Anne, and Talbot. In 1888 three additional counties—Charles, Dorchester, and Howard—adopted the system; and more recently all the other counties in the State have followed their example; but in 1894 Anne Arundel repealed the license provision and prohibited nonresidents from hunting within the county. (Laws of 1894, chap. 103.)

In 1884 New York passed a special license law (Laws of 1884, chap. 185), which required nonresidents of Richmond County (Staten Island) to secure a $10 license before hunting game in that county. This local license law remained in force until repealed by the general game law of 1892, eight years later, and is apparently the only license of the kind enacted by the State. The general licenses of 1900–1903, reciprocal in character and without fixed fees, merit special consideration, and will be discussed in connection with similar licenses of other States.

In 1892 South Carolina required a $25 license of nonresidents hunting in Beaufort County, and in 1893 extended the law to the rest of the State. In 1899 Illinois adopted a $10 nonresident county license, and West Virginia a $25 county license (both of which have since been changed to State licenses). In 1900 Iowa established a $10 nonresident county license; in 1901 South Dakota and Washington adopted $10 county licenses; and in 1903 Colorado established a county license for nonresidents hunting birds, all of which still remain in effect, except that of Washington, which has been replaced by a hunting license required alike of residents and nonresidents.

This may be said to cover the first period of nonresident-license legislation. The licenses in New Jersey, Delaware, and Virginia were in the nature of fees for membership in private corporations, and those of all the States except Delaware were alike in being local licenses, in most cases good only for the county of issue. With a few exceptions the license fees were comparatively small, usually less than $10. The county license has not met with general favor. It has been adopted by only a few States, and is now in force in less than one-third of the States which have the license system.

MARKET-HUNTING LICENSES.

The effort in some of the Southern States to restrict market hunting and to prevent the export of game from the State for commercial purposes brought about a twofold result—the development of the market-hunting license and the absolute exclusion of nonresidents from hunting privileges. A correspondent of the American Field, who states that he has observed game conditions in Arkansas for twenty-five years, asserts that 90 per cent of the game killed in that State has been killed by market hunters. (Am. Field, LIX, p. 216, Feb. 28, 1903.) In view of this statement, which apparently has strong independent support, it is interesting to notice that Arkansas seems to have been the pioneer in restrictions on market hunters. In the act of March 6, 1875, a tax of $10 was levied on all nonresident trappers, hunters, seiners or netters of fish following their calling in the State. Twenty-two years later, in 1897, the tax was increased to $25. (Acts of 1897, p. 113.) In 1903 two bills were passed by the legislature—one imposing a tax of $300 on all nonresidents hunting in the State, the other absolutely prohibiting hunting by nonresidents except in Mississippi County. The license bill was vetoed; the prohibition bill became a law.

Missouri, in 1877 (Laws of 1877, p. 333), prohibited nonresidents from hunting game for the purpose of selling it or removing it from the State, and in 1879 extended this law so as to prohibit nonresidents from hunting at all within the State.

In 1879 Tennessee enacted legislation prohibiting nonresidents from hunting deer for profit in some counties, and in 1889 in others restricted such hunting to persons hunting on their own lands. These provisions were repealed in 1903 by the adoption of a general game law which provided a market-hunting license of $25 and authorized the State game warden to collect from nonresident sportsmen the same fee which residents of Tennessee would be subject to in their States.

In 1884 South Carolina enacted a law requiring each nonresident engaged in the business of hunting, ducking, fishing, or gathering oysters or terrapin, or in the sale of game in the counties along the sea board—Georgetown, Charleston, Beaufort, Colleton, and Berkeley—to pay a license at the rate of $25 for each nonresident hand employed. (Laws of 1884, p. 734.) These licenses were not required of persons hunting or fishing on their own lands or waters included within them, nor, under an amendment passed in 1892, of persons authorized by landowners to hunt on their property. By act of 1885 a fixed fee of $25 was imposed for the license and also a fee of $25 for each nonresident hand employed, and in 1888 these fees were increased to $500 and $100, respectively, thus raising the cost to a point far above that of any other market-hunting license. Neither of these statutes appears in the code of 1902, and South Carolina is at present without a nonresident license law.

In 1899 Georgia (Acts of 1899, part 1, p. 96) adopted a law authorizing a $25 market-hunting license, but provided that the act was not to be in force in any county until recommended by the grand jury of that county.

Oregon, the only other State to adopt the market-hunting license, passed a law in 1901 making it unlawful for any person not a resident of the State to hunt any game for market purposes without having first obtained a $10 license from the State game and forestry warden. (Laws of 1901, p. 231, sec. 38.)

By an act passed in 1902 Louisiana, following the lead of Missouri and Arkansas, adopted absolute prohibition in the case of nonresident hunters. This act, however, was replaced in 1904 by a $10 nonresident hunting license and a $25 market-hunting license. Thus at the present time the restrictions on market hunting in the South have developed into absolute prohibition in Arkansas and Missouri, into market licenses in Georgia and Louisiana, a market license and modified nonresident license in Tennessee, and the abolition of all licenses in South Carolina. The moderate market license of Oregon remains unchanged.

It is to be observed that the easternmost of these States, South Carolina and Georgia, adopted the county license system, and that there seems to have been a marked inclination toward $25 as the amount of the fee.

GENERAL LICENSES.

The general license seems to have had its origin in Canada. The same feeling of discrimination so conspicuous in the game legislation of the United States existed in Canada, but instead of manifesting itself in absolute prohibition it there took the more liberal form of a system of high licenses for hunting big game. New Brunswick apparently led the way about 1878, and was followed by Quebec in 1882, Nova Scotia in 1884, Ontario in 1888, Newfoundland in 1889, British Columbia and Manitoba in 1890, and the Northwest Territories in 1893. The license sytem thus extended throughout Canada, except Prince Edward Island, Yukon, and the Unorganized Territories. Fees varying from $20 to $25 were charged in some cases for big game only, but in others for hunting game of any kind.

In 1895 general licenses found favor in the Northwestern States, and laws undoubtedly modeled after those of the Canadian Provinces were enacted in several States. This sudden demand for nonresident licenses is interesting from several standpoints, and may have been influenced by two circumstances. On January 9–10, 1895, occurred the second annual meeting of the National Game, Bird and Fish Protective Association at Chicago, at which resolutions were adopted foreshadowing methods of game protection, including shooting licenses, which have since been incorporated into law.[a] About this time a bill was pending in the Illinois legislature practically opening the Chicago markets to unlimited sale of game from other States.[b] Whatever may have been the effect of this convention and of the Illinois game bill, they certainly served to draw attention to the question of discriminating against nonresidents, and although it may have been only a coincidence, nonresident license laws were adopted almost immediately by four States[c]—Wyoming in February, North Dakota in March, Minnesota in April, and Michigan in May. Wisconsin followed in 1897, four other States in 1899, six in 1901, and eight in 1903.

RESIDENT LICENSES.

The history of modern resident hunting licenses properly begins with the system of special licenses developed in some of the counties of Maryland in the early seventies and eighties. Shooting wild fowl from sink boxes, sneak boats, or in some cases from blinds was prohibited except under license, and these licenses were issued only to residents. The first of these special laws was passed in 1872 (Laws of 1872, chap. 54) for the protection of wild fowl on the Susquehanna Flats, at the head of Chesapeake Bay. Section 7 of this act provided:

> No owner, master, hirer, borrower, employee of any owner, or other person, shall use or employ any sink box, or sneak boat of any description whatever, for the purpose of shooting at wild water-fowl therefrom, northward of the line named and described in section 380 [drawn half a mile north of Spesutie Island from Turkey Point, in Cecil County, to the opposite shore of Harford County], without first obtaining a license to so use and employ the same as is hereinafter provided.

The license fee for a sink box was $20, and for a sneak boat $5. The licenses were issued by the clerks of Harford and Cecil counties, and the clerk was allowed 75 cents for issuing each license.

Under section 11 of the same act applicants were required to make oath that they were bona fide residents of the State, and a fine of $50 to $100 was provided for violating any of the license provisions, one-half of which was to be paid to the informer and one-half to the school commissioners of the county. A board of special police was appointed to enforce the provisions of the act, and these officers, commonly known as ducking police, were authorized to seize any sink box or boat used in violation of law. The issue of licenses was thus restricted to residents of the State. Nonresidents were not denied the privilege of hunting waterfowl, but they could not hunt successfully without sink boxes or boats; and, as these could only be used under license, residents who alone were authorized to obtain licenses could control hunting and charge any fees they saw fit for their boxes or boats.

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[a] Am. Field, XLIII, pp. 51–52, Jan. 19, 1895.

[b] House bill 56, commonly known as the 'Blow Bill.' For full text of this measure and the discussion relating to it, see Am. Field, XLIII, pp. 123, 147, 1895.

[c] A game bill containing a $50-nonresident license provision was also introduced in the Nebaska legislature, but failed to pass.—Forest and Stream, XLIV, p. 307, April 20, 1895.

In 1876 the use of sink boxes in the waters of Anne Arundel County with certain exceptions, or on Chesapeake Bay within the limits of the county, was restricted to licensed residents of the county. These licenses were issued at a cost of $30 each. (Laws of 1876, chap. 78.) In 1882 licenses at $2 each (and a clerk's fee of 50 cents) were required for the use of 'booby' or 'bush' blinds on the Magothy, Severn, and South rivers. It is noticeable, however, that the issue of licenses for blinds was not restricted to residents, and that the owner could extend to any person the privilege of shooting from his blind during the open season. (Laws of 1882, chap. 400; 1886, chap. 366.)

In 1878 residents of Cecil County were required to obtain licenses, at a cost of $10, to use sink boxes on the waters of the Elk and Bohemia rivers (Laws of 1878, chap. 292); and in 1880 similar $10 licenses were required in Queen Anne County, and in Cecil and Kent counties for the use of sink boxes on the Sassafras River. (Laws of 1880, chaps. 42 and 370.)

Turning to Canada, mention should be made of a special $5 license which came into use in the Province of Quebec in 1887.[a] This license differed from ordinary resident licenses in being issued only for killing 5 deer and 5 caribou in excess of the limit prescribed by law. The fee still remains the same, but since 1895 the number of deer and caribou has been reduced to 3.

The system of general resident hunting licenses apparently originated in Michigan in 1895[b] as a measure to restrict the slaughter of deer. In his annual report for 1894, Charles S. Hampton, game and fish warden of Michigan, said:

> I am of the opinion that a law licensing all hunters, those of our own State being charged a mere nominal fee, while nonresidents are compelled to pay twenty-five dol-

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[a] Reference may here be made to a somewhat different form of license which was proposed in Colorado in 1885, but not adopted. Licenses were to be issued to immigrants traveling in unsettled parts of the State, allowing them to kill game during the close season for periods not exceeding 30 days at a cost of $5 or $10. (Am. Field, XXIII, p. 121, Feb. 7, 1885.)

[b] It was, however, advocated in Illinois at the same time. Section 7 of the 'Blow Bill,' which failed to pass the Illinois legislature of 1895, contained a provision for a $1 license for all persons except owners or occupants of cultivated farms hunting on their own lands. (Am. Field, XLIII, p. 124, Feb. 9, 1895.)

lars, is for the present, at least, the best restrictive measure. The decision of the Supreme Court of the United States in McCready vs. Virginia (94 U. S. 391) would seem to set at rest all doubts as to the constitutionality of such a law. Any man carrying a gun and not having a license in his possession, or refusing to show it to any citizen on demand, should be subject to penalty. (Fourth Biennial Report, p. 10.)

Acting on this suggestion, the legislature in 1895 adopted a 50-cent resident license and a $25 nonresident license for hunting deer.

Hawaii, in 1896, before its annexation, passed a law establishing a $5 hunting license for the island of Oahu, and this law still remains in force without change. The high rate is perhaps due in part to the fact that this license is a permit to carry firearms as well as to hunt game, but more especially to the fact that all the game on the island is introduced, and in order to prevent its extermination stricter regulations and higher fees are necessary than would be required under ordinary circumstances.

In 1897 Wisconsin adopted licenses for deer hunting similar to those of Michigan, but made the rate for residents $1. In 1899 Minnesota adopted a 25-cent license for big game; North Dakota, a 75-cent license for all game, and Wyoming, a dollar license for big game; the Wyoming license is required, however, only outside the county in which the hunter resides. Maine also issued licenses at $4 each, allowing residents to kill one deer during the month of September, for food purposes only, in certain counties;[a] but the law met with so much opposition that it was repealed two years later. One dollar resident licenses for big game were adopted in 1901 by South Dakota, and for all game by Nebraska and Washington; in 1903 for all game by Illinois, Colorado, and Idaho, and for waterfowl during the fall season by Indiana; and in 1904 for all game in Somerset County, Md. Thus the resident license system has spread to 13 States and to 3 provinces of Canada.[b] (See Pl. II.)

At first licenses were required only for hunting big game, but there is now a strong tendency to extend them to cover all game, though of States having resident licenses Michigan, Minnesota, South Dakota, Wyoming, New Brunswick, Ontario, and Quebec still have no licenses for small game, while in Indiana none is required except for shooting waterfowl in the fall. The fee, which exhibited considerable diversity at first—50 cents in Michigan, $1 in Wisconsin, 25 cents in Minnesota, 75 cents in North Dakota, $4 in Maine, and $5 in Hawaii—is now uniformly $1, with the exception of the 75-cent fee in North Dakota and Michigan, the $5 fee in Hawaii, the $2 fees in New Brunswick and Ontario, and the $5 fees in Ontario and Quebec. Some diversity still

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[a] In eight of the sixteen counties: Oxford, Franklin, Somerset, Piscataquis, Penobscot, Aroostook, Hancock, and Washington, which comprise more than four-fifths of the area of the State.

[b] Including Quebec, which issues such licenses only for killing big game in excess of the bag limit.

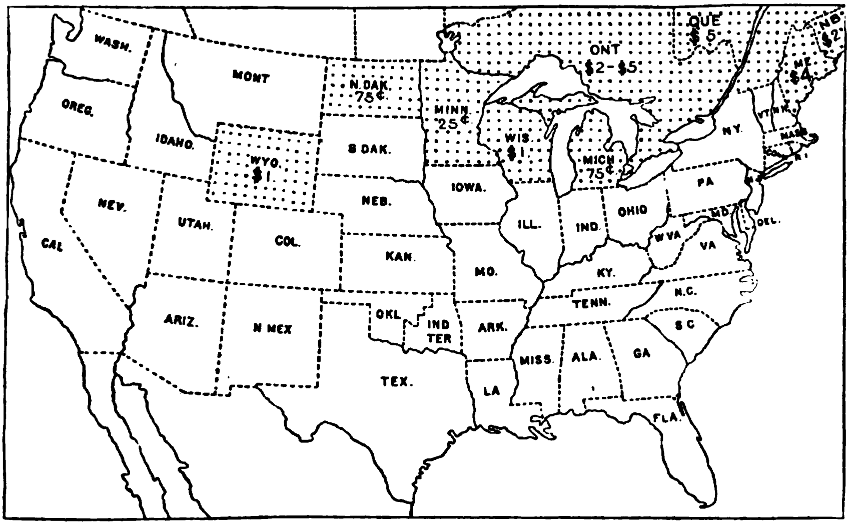


FIG. 1.—STATES HAVING RESIDENT LICENSE LAWS IN 1900.

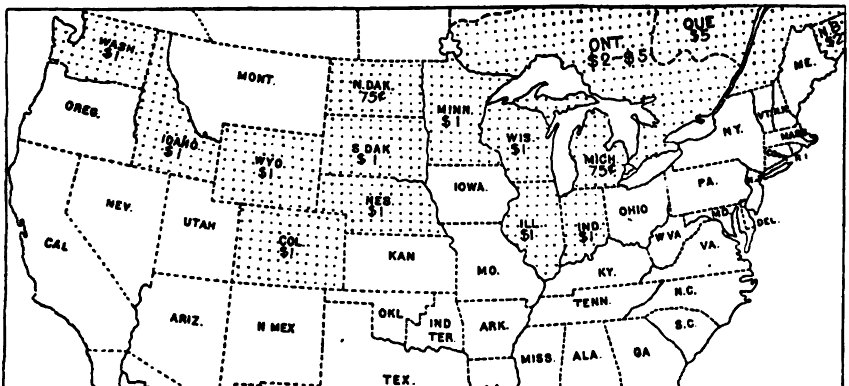


FIG. 2.—STATES HAVING RESIDENT LICENSE LAWS IN 1904.

MAPS SHOWING PROGRESS IN RESIDENT LICENSE LEGISLATION.

exists in regard to the territory covered by licenses. In South Dakota and Washington and in Somerset County, Md., they are good only in the county of issue; in Nebraska and Wyoming they are not necessary in the county of residence; and in Illinois and North Dakota they are not required in the case of a citizen hunting on his own land.

SUMMARY OF LICENSE LEGISLATION.

The progress of legislation outlined above may perhaps be brought out more clearly by summarizing under each State and Province the important laws and changes in fees. In the appendix, p. 55, will be found a chronological index of the license laws from 1872 to 1904. The year 1872 is taken as the starting point because it apparently marks the first enactment of a hunting license law in the United States. It should also be explained that the gradation from an ordinary license through one with an exorbitant fee to absolute prohibition is so gradual that it is difficult to draw the line of demarkation. For this reason prohibitive statutes passed since 1872 are included in the summary, and although no systematic attempt has been made to collect earlier ones, those of most interest are referred to on pp. 10–12.

TABLE SHOWING DATES OF ADOPTION OF LICENSE SYSTEM AND PRINCIPAL CHANGES IN FEES.

Arkansas.—**1875**, $10 market-hunting license; **1897**, fee increased to $25; **1903**, nonresidents prohibited from hunting in the State, except in Mississippi County.

Colorado.—**1903**, $25 nonresident general license, $1 a day bird license ($2 first day), $1 resident license.

Delaware.—**1879**, Nonresident license, $5 first year, $2 subsequent years.

Florida.—**1875**, $25 nonresident county license for hunting game for export; **1899**, $10 nonresident county license for deer, turkeys, or quail; **1903**, $10 nonresident county license for any game. Nonresident license, $1 per day, in La Fayette County.

Georgia.—**1899**, $25 market-hunting license.

Hawaii.—**1896**, $5 hunting license in Oahu.

Idaho.—**1903**, $25 nonresident license for all game, $5 license for birds, $1 resident license.

Illinois.—**1899**, $10 nonresident county license; **1901**, $10 nonresident State license; **1903**, $15 nonresident license, $1 resident license.

Indiana.—**1901**, $25 nonresident license, free permits for hunting squirrels and wild fowl October 1–November 10 issued to residents and licensed nonresidents; **1903**, $1 resident permit for hunting wild fowl October 1–November 10 (free to licensed nonresidents).

Iowa.—**1900**, $10 nonresident county license.

Kentucky.—**1902**, $25 nonresident license; **1904**, variable fee established.

Louisiana.—**1902**, Nonresidents prohibited from hunting in the State; **1904**, $10 nonresident license (required also of unnaturalized residents), $25 market-hunting license.

Maine.—**1899**, $6 nonresident, $4 resident, September deer license; **1901**, law repealed; **1903**, $15 nonresident State license for deer and moose, $5 nonresident license for ducks and sea and shore birds in 5 counties.

Maryland.—**1872**, $20 sink box and $5 sneak-boat licenses on Susquehanna flats for residents of Cecil and Harford counties.

1876, $30 sink-box license for residents of Anne Arundel County.

1878, $10 sink-box license on Elk and Bohemia rivers for residents of Cecil County; fee for sink-box license on Susquehanna flats reduced to $10 in case of residents of Cecil County.

1880, $10 sink-box license on Sassafras River required of residents of Cecil and Kent counties; nonresidents of Anne Arundel, Calvert, Charles, Prince George, and St. Mary counties prohibited from shooting snipe, rail, and wildfowl on Patuxent River; $10 sink-box license for residents of Queen Anne County (nonresident not allowed to use sink box).

1882, $2 'blind' license on Magothy, Severn, and South rivers in Anne Arundel County; $4.50 nonresident license for rabbits, muskrats, quail or partridges, woodcock, rail, and ducks in Caroline County.

1886, Nonresident county licenses as follows: Anne Arundel and Prince George, $6 (rabbits, partridges, and woodcock); Baltimore, $10 (rabbits and woodcock); Caroline, $19.50 (rabbits, muskrats, quail or partridges, woodcock, rail, and ducks); Kent, $4.50 (all game); Queen Anne, $4.50 (all game); Talbot, $9.50 (all game).

1888, Caroline County license fee reduced to $4.50; nonresident county licenses as follows: Charles, $20 (rabbits, partridges, and woodcock), $25 (wildfowl); Dorchester, $5 (rabbits, partridges, and woodcock); Howard, $7.50 (all game).

1890, Nonresidents prohibited from hunting wildfowl on Little Choptank River in Dorchester County; nonresident county licenses as follows: Somerset, $9.50 (all game); Worcester, $10 (wildfowl).

1892, Nonresidents hunting snipe, rail, and wild fowl on Patuxent River in Anne Arundel and Prince George counties required to have permission of a majority of the residents near the river and to employ licensed boat; $2 pusher's license required on Patuxent River; $20 nonresident license for rabbits, partridges, and woodcock in St. Mary County.

1894, Citizens of Calvert County allowed to hunt snipe, ortolan, and wild fowl on Patuxent River in Anne Arundel and Prince George counties; nonresidents prohibited from hunting in Anne Arundel County or shooting wild fowl in Charles County; sink-box license on Elk and Bohemia rivers in Cecil County abolished and use of boats for hunting wild fowl prohibited. Nonresident county licenses as follows: Baltimore, $10 (gray squirrels, rabbits, partridges, pheasants, and woodcock); Carroll, $10 (squirrels, rabbits, partridges, pheasants, and woodcock); Harford, $10 (rabbits, partridges, pheasants, woodcock, rail, reedbird, and robins); Kent, $15 (rabbits and birds); Prince George, $20 (rabbits, partridges, and woodcock).

1900, $10 sink-box license on Elk and Bohemia rivers reestablished. Nonresident county licenses for hunting any game as follows: Garrett, $25; Somerset, $9.50.

1902, Nonresident county licenses as follows: Calvert, $10 (rabbits, partridges, and woodcock); Cecil, $5.50 (rabbits, quail or partridges, grouse, woodcock, reedbirds, 'ortolan or rail, and summer ducks); Frederick, $15 (rabbits, partridges, pheasants, wild turkeys, woodcock, and ducks); Montgomery, $15 (squirrels, rabbits, partridges, pheasants, wild turkeys, woodcock, and ducks); Prince George, $20 (rabbits, partridges, pheasants, and woodcock); Washington, $10 (hunting or fishing in county, except on Potomac River, not applicable to taxpayers or residents of Maryland or District of Columbia); Wicomico, $10 (all game).

1904, Nonresident landowners and guests of resident landowners allowed to hunt in Anne Arundel County; special Patuxent River $10 license required of nonresidents hunting birds (members of certain hunting clubs exempt), and $2.50 pusher's license required of residents of State; nonresident license in Baltimore County extended to cover jacksnipe and fee reduced to $5 (photograph of holder required on license). Nonresident county licenses as follows: Allegany, $10 (all game); Somerset, $10 (squirrels, rabbits, muskrats, quail or partridges, doves, woodcock, ducks, and geese); resident county license, Somerset, $1.

Michigan.—**1895**, $25 nonresident license, 50-cent resident license for hunting deer; **1897**, resident license fee increased to 75 cents.

Minnesota.—**1895**, $25 license required of citizens of States having restrictions against nonresident hunters; **1899**, $25 nonresident license and 25-cent resident license for big game; **1903**, $25 nonresident license for big game, $10 nonresident license for small game; resident license extended to cover all game animals and fee increased to $1; license law of 1895 repealed.

Missouri.—**1877**, Nonresidents prohibited from hunting game for sale or export; **1879**, nonresidents prohibited from all hunting in the State.

Montana. **1901**, $25 big-game license and $15 bird license required of nonresidents who pay no taxes in the State.

Nebraska.—**1901**, $10 nonresident license, $1 resident license (not required in county of domicile).

New Hampshire.—**1903**, $10 nonresident deer license.

New Jersey.—**1873**, $5 nonresident license for hunting in Atlantic, Camden, Cape May, Cumberland, Gloucester, or Salem counties; **1896**, license law repealed; **1878**, nonresidents prohibited from hunting in the State except in compliance with the by-laws of the game protection societies; **1902**, $10 nonresident license for any game except waterfowl, snipe, and mud hens.

New York.—**1884**, $10 nonresident license for hunting on Staten Island; **1892**, license law repealed; **1900**, nonresident taking fish or game on fresh waters bounding State subject to same restrictions as citizen of New York in State of nonresident; **1902**, nonresidents subject to license restrictions imposed by their own States on nonresidents; **1903**, license fee fixed by commissioner in case of nonresidents from States without license laws.

North Carolina.—**1883**, Nonresidents prohibited from shooting wild fowl from floating blinds or batteries in Currituck and Dare counties; **1895**, $25 nonresident license for shooting on Dare County ducking grounds; **1897**, nonresidents prohibited from hunting birds in Camden County; **1899**, $25 nonresident license for clubhouses in Dare County; **1903**, $10 nonresident license ($20 in Cabarrus County).

North Dakota.—**1895**, $25 nonresident license and 50 cents resident license (landowners hunting on their own property exempt, and nonresidents cultivating quarter section of land need only resident license); **1897**, resident license fee increased to 75 cents, and nonresident owners of cultivated lands required to secure resident licenses; **1899**, residents under 16 exempt.

Ohio.—**1902**, $25 nonresident license; **1904**, fee reduced to $15.

Oregon.—**1901**, $10 nonresident market-hunting license.

Pennsylvania.—**1901**, $10 nonresident license (landowners exempt); **1903**, same license required of unnaturalized foreign-born residents.

South Carolina.—**1884**, $25 license for each nonresident hand employed by nonresidents hunting ducks in Beaufort, Berkeley, Charleston, Colleton, and Georgetown counties; **1885**, license modified to add $25 fee for pursuit of the business; **1888**, license fee increased to $500 and $100 additional fee for each nonresident employed by licensee; **1892**, $25 nonresident license for hunting in Beaufort County; market-hunting license extended to Horry County; **1893**, $25 nonresident county license extended to rest of State (persons hunting on their own land exempt); **1902**, repealed by omission from code.

South Dakota.—**1899**, $10 nonresident county license; **1901**, $25 nonresident and $1 resident county licenses, for big game.

Tennessee.—**1877**, Nonresidents of Lake and Obion counties prohibited from killing wild fowl for market on Reelfoot Lake; **1879**, market hunting prohibited in 13 counties; **1889**, nonresidents of the county prohibited from market hunting in certain counties and from all hunting in others; nonresidents of the State prohibited from killing wild fowl on Reelfoot Lake; **1897**, nonresidents of Grundy and Van Buren counties prohibited from killing deer, quail, and wild turkey in these counties; **1901**, similar law for Bledsoe County; **1903**, $25 market-hunting license and nonresident license with same fee as resident of Tennessee is required to pay in State of applicant.

Utah.—**1903**, $10 nonresident gun license.

Virginia.—**1886**, Nonresidents prohibited from killing wild fowl from skiffs or sink boxes in Fairfax, Henrico, King George, Prince William, and Stafford counties; **1891**, nonresidents prohibited from killing wild fowl on lands below head of tide water, except in Accomac and Northampton counties; **1894**, nonresidents, except members of the Eastern Shore Game Protective Association, prohibited from killing wild fowl in Accomac and Northampton counties; **1900**, $10 nonresident county license for deer and upland game birds in Alleghany, Augusta, Bath, Botetourt, Highland, and Rockbridge counties; **1903**, $10 nonresident license (children and guests of resident landowners exempt under certain conditions).

Washington.—**1901**, $10 nonresident county license and $1 resident county license (persons under 16 exempt, and privileges of resident license extended to citizens of Idaho and Oregon); **1903**, uniform $1 county license for residents and nonresidents.

West Virginia.—**1899**, $25 nonresident county license; **1903**, $15 nonresident State license.

Wisconsin.—**1897**, $30 nonresident deer license, $1 resident deer license; **1899**, nonresident deer license fee reduced to $25, $10 nonresident license for other game, $1 resident license for all game.

Wyoming.—**1886**, Nonresidents prohibited from hunting game animals; **1895**, $20 nonresident county license for big game; **1899**, fee increased to $40; $1 resident gun license for hunting big game outside county of residence; **1903**, nonresident license fee increased to $50.

British Columbia.—**1890**, $50 nonresident license for big game (members of army, navy, and Canadian militia exempt).

Manitoba.—**1890**, $25 nonresident license.

New Brunswick.—**1878**, $20 nonresident license (fee $5 for officer of army or navy); **1897**, $20 nonresident, $2 resident licenses for moose or caribou, nonresidents required to give $100 bond, with two resident sureties; **1900**, fee for nonresident license for hunting moose and caribou increased to $30; $30 nonresident license for hunting in Westmoreland County; **1903**, 25 cent resident license for hunting in Westmoreland County.

Newfoundland.—**1889**, $100 nonresident caribou license (officers of British war ships stationed on coast for fisheries' protection exempt); **1899**, caribou license fees reduced as follows: $40 for 2 stags and 1 doe, $50 for 3 stags and 1 doe, $80 for 5 stags and 2 does; **1902**, $100 nonresident license permitting killing of 3 stag caribou; **1903**, fee reduced to $50.

Northwest Territories.—**1893**, $5 nonresident license for big game or birds (five-day licenses free to guests of residents); **1898**, nonresident license for all protected game increased to $15, guest license abolished; **1899**, $1 five-day license for hunting by nonresident guest of resident, $15 nonresident license for calendar year (all big game and birds); **1903**, $25 nonresident license for all game and $15 nonresident license for birds.

Nova Scotia.—**1884**, $30 nonresident moose license and $10 nonresident bird license ($5 fee for officers of army and navy, members of Game Protection Society exempt); **1896**, $30 nonresident license for big game, $10 nonresident license for birds, hares, and rabbits ($5 fee restricted to officers stationed at Halifax, employees of Provincial or Canadian government, persons formerly domiciled in Nova Scotia, and nonresidents paying $20 real-estate tax exempt); **1902**, big game license modified to cover all game and fee increased to $40; **1904**, special $30 nonresident license required for moose.

Ontario.—**1888,** $10 nonresident license for deer (shareholders of incorporated company hunting on lands of company exempt); **1892,** $25 nonresident license for big game or birds; **1896,** $2 resident license for deer; **1900,** $5 resident license for moose, reindeer, or caribou.

Quebec.—**1882,** $20 nonresident license; **1884,** residents of Ontario exempted and lieutenant-governor in council empowered to grant hunting permits at lower rate or gratuitously; **1887,** $5 license permitting residents to kill 5 caribou and 5 deer above regular limit, $10 fee to members of incorporated hunting and fishing clubs; **1895,** number of extra caribou and deer allowed under $5 license reduced to 3; nonresident licenses as follows: $30, all game; $25, big game and fur-bearing animals; $20, game birds; $10, game birds in the Gulf of St. Lawrence; half rates for members of incorporated fish and game clubs; **1897,** nonresident license fees fixed by lieutenant-governor in council, lower rates for members of incorporated fish and game clubs leasing hunting reserves.

DETAILS OF LICENSES.

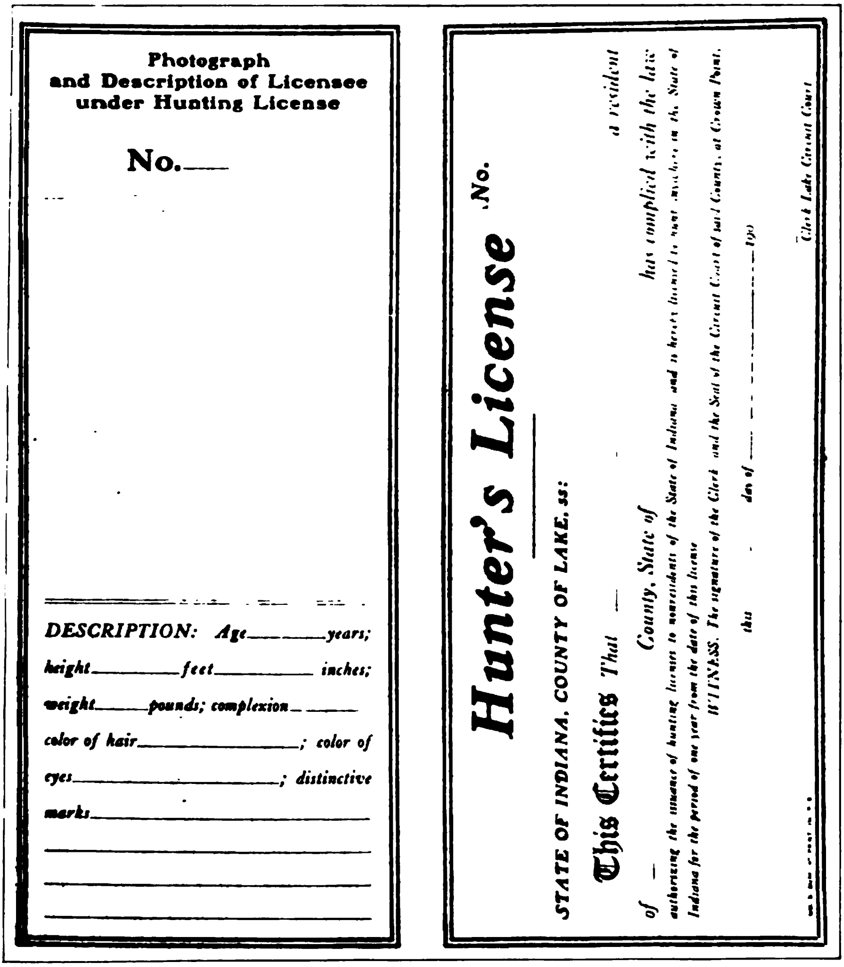
The various matters connected with the issue of licenses may be conveniently considered under four heads—forms of licenses, fees, details of issue, and exemptions or privileges.

FORMS OF LICENSES.

It is interesting to note the development in the form of the license. Some States, like Delaware, Florida, and North Dakota, still issue a simple license to hunt or kill game. Others, like New Hampshire, New Jersey, and Pennsylvania, have adopted forms which, to prevent transfer, contain a description of the holder. Illinois in 1901 went a step further and required that the owner's photograph appear on the license. After two years' trial this feature was discontinued, but simultaneously with its abandonment by Illinois it was adopted by Indiana (see Pl. III), and in 1904 by Baltimore County, Md. New Brunswick in 1897 required the licensee to give a $100 bond with two resident sureties.

The most complete form of license is the coupon license, (see Pl. VI), first devised by Michigan in 1897, and since adopted by Colorado. Maine, Minnesota, Montana, Wisconsin and Wyoming. It is designed to allow shipment of a certain specified quantity of fish or game by the holder, and at the same time to maintain a check on such shipments. Each license is provided with a number of coupons corresponding to the number of deer or other game which may be lawfully shipped, and one of these coupons must be attached to each head, carcass, or skin, before shipment. Several improvements have been made developing slightly differing forms, but the best is probably that in use in Minnesota. This license contains an abstract of the law, is mounted on cloth and is arranged to fold conveniently so that it can be carried in the pocket without injury, and each coupon is provided with a metal eyelet to facilitate attachment to the game (see Pl. IV).

A form of nonresident license reciprocal in nature has been adopted in a few States. It originated in Minnesota in 1895, and was adopted with some modifications by New York in 1900–1902, Tennessee in 1903, and Kentucky in 1904, but has now been abandoned by Minnesota and further modified by New York. As originally enacted in Minnesota it was a simple $25 nonresident license but applicable only to "citizens of such States as have restrictive laws against nonresident hunters." New York changed the scheme so as to make the law general, but provided that the fee should be the same as that charged nonresidents in the applicant's State. In 1903 it modified the law so as to empower the forest, fish, and game commissioner to fix a fee for licensees from



**Photograph
and Description of Licensee
under Hunting License**

No.____

DESCRIPTION: Age_______years; height_______feet_______inches; weight______pounds; complexion________ color of hair_______________; color of eyes________________; distinctive marks____________________

Hunter's License No.

STATE OF INDIANA, COUNTY OF LAKE, ss:

This Certifies *That ____________ a resident of ________ County, State of ________ has complied with the law authorizing the issuance of hunting licenses to nonresidents of the State of Indiana and is hereby licensed to hunt anywhere in the State of Indiana for the period of one year from the date of this license*

WITNESS, The signature of the Clerk and the Seal of the Circuit Court of said County, at Crown Point,

this ______ day of ________________ 190

Clerk Lake Circuit Court

THE PHOTOGRAPH LICENSE OF INDIANA, 1903.

Size 7¼ by 9¼ inches, printed on buff cardboard, and folded for mailing or carrying in the pocket.

States which have no fees for nonresident licenses. Tennessee and Kentucky adopted the general plan of the New York law of 1902.

The reciprocal license is experimental and has been adopted only in States which have not yet established a regular license, or where the usual form of license has proved unsuccessful. At first sight it seems to have much in its favor, since it taxes only hunters from States where the nonresident license system is in force, but the requirement is very difficult of enforcement and its inequalities are likely to arouse resentment. The Minnesota law, which was one of the first in the country providing for general licenses, proved a failure, and thus far the New York law has been a dead letter. Kentucky apparently adopted the plan chiefly because its own first high-license law was not a success, while the Tennessee law was proving more effective. Tennessee is, in fact, the only State in which this method seems to have accomplished its purpose. If each State had a single fixed rate it might be possible to carry out the idea with some degree of success, but when the applicant is a resident of a State where separate rates are in force for large and small game, as in Idaho, Minnesota, Colorado, Montana, North Dakota, South Dakota, and Wisconsin, it is not easy to do so; and when he resides in a State like Maryland, where the license fee varies with each county, it is difficult to determine what rate he should be charged. The question is still further complicated by exemptions allowed landowners, as in North Dakota, or guests, as in Maryland and Virginia. Furthermore, it is not clear what is expected of a nonresident from New York hunting in Kentucky or Tennessee, or vice versa. Apart from these administrative difficulties the law is likely to create friction in a rigid enforcement of its provisions. Two residents from Maryland, for example, hunting in the Adirondacks might think it unfair that one should be charged $5 and the other $25 because the first happened to be a resident of Dorchester County and the second of Garrett County; and it would be equally irritating to two residents of Maryland hunting on the same estate in Tennessee by invitation of the owner if one, being from Washington County, should have the privilege without charge, while the other, being from Garrett County, should have to pay a fee of $25, because Washington County exempts from the license laws nonresidents hunting by invitation on their host's land, while Garrett County makes no such exemption.

FEES.

The fees charged for nonresident licenses have varied from $1 to $500, those for resident licenses from 25 cents to $5. One dollar is the present rate charged residents and nonresidents alike in Washington[a] (see Pl. VII), and $500—probably the highest game license fee in the world—that formerly required for a nonresident market-hunting license in South Carolina. Other high licenses are those for caribou in Newfoundland, $100, in 1889 and 1902, but now reduced to $50, and the present $50 license fees for big game in British Columbia and Wyoming (see Pl. VII). Apparently the rate is often fixed without regard to the kind of game which the State has to offer, and is influenced more or less by the fees prevailing in neighboring States. Thus Indiana and Ohio, which have no big game, require nonresidents to pay $25, the same rate which is required in Idaho and Montana, where deer, elk, goats, and other big game may be obtained. Maine, which has excellent big game hunting, exacts but $15, and Utah but $10, while South Carolina, which offers little beside game birds, until recently required $25, and made the license good only in the county in which it was issued. Maine and New Brunswick both have moose and deer and offer much the same opportunity for hunting, but the fee in New Brunswick is $30, or exactly twice that in Maine. The tendency at the present time seems to be in the direction of a license of $25 for big game and $10 for game birds, both good throughout the State. The only States in which county licenses still prevail are Florida, Georgia, Iowa, Maryland, South Dakota, and Washington. In Colorado they are also issued to nonresidents hunting birds.

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[a] Although Washington, in 1903, actually established the first low uniform fee for residents and nonresidents in the United States, the same principle was advocated eight years earlier in Illinois in a bill which failed to pass the legislature in 1895. (See footnote, p. 17).

DETAILS OF ISSUE.

The following table shows the States that require nonresident licenses, the amounts of the fees, the officials from whom licenses are obtainable, the disposition of the fees, and the limitations as to the amount of game that may be exported.

Details of Nonresident Licenses for hunting game.[a]

State.	Fee.	By whom issued.	Disposition of fee.	Export limit; remarks.
Arkansas				Nonresidents not permitted to hunt.
Colorado	$25(all game).	Commissioner of game.	Game protection.	Export allowed under permit.
	$1 per day (birds).	....do	.....do	County license for birds, $2 first day.
Delaware	$5 first year, $2 thereafter.	Delaware Game Protective Association.	.....do	Export of rabbits, quail, partridges, woodcock, robins, Wilson snipe prohibited.
Florida[b]	$10	Clerk county circuit court.	.....do	Export of deer, quail, wild turkeys prohibited. County license.
Georgia	$25	County ordinary	County treasury	County market hunting license. Export of quail prohibited.

[a] For exemptions see pp. 30-32.

[b] License not applicable to counties having special game laws.

Details of Nonresident Licenses for hunting game—Continued.

State.	Fee.	By whom issued.	Disposition of fee.	Export limit; remarks.
Hawaii (Oahu)	$5	Treasurer		
Idaho	$25 (all game)	State warden or deputy, justice of the peace.	Game protection	2 deer, 1 ibex, 1 goat, 1 sheep, 1 elk per season.
	$5 (birds)	do	do	Export of birds prohibited.
Illinois	$15	County clerk	do	50 birds.
Indiana	$25	Clerk of circuit court of county.	do	24 birds.
Iowa	$10	County auditor	do	25 of all game. County license.
Kentucky	(a)	County clerk	State treasury	Export prohibited.
Louisiana	$10	Sheriff of parish	Game protection	1 deer, 12 birds.
Maine (moose and deer).	$15	Commissioners of inland fisheries and game.	do	1 moose, 2 deer per season.
	$5 (ducks and shore birds).[b]	do	do	
Maryland	$1.50-$25	Clerk of circuit court.	Schools, roads, or general county expenses.	Separate county laws, with varying export provisions.
Michigan	$25 (deer)	County clerk	Game protection	Export prohibited.
Minnesota	$25 (big game) $10 (birds).	Board of game and fish commissioners.	do	2 deer, 1 moose, 1 caribou, 25 birds.
Missouri				Nonresidents not permitted to hunt.
Montana	$25 (big game); $15 (birds).	State game and fish warden.	Game protection	6 deer, 2 elk, 6 goats per season; 20 grouse, prairie chickens, fool hens, pheasants, sage hens, partridges, doves per day.
Nebraska	$10	Game and fish commissioner.	Schools	50 birds.
New Hampshire	$10 (deer)	Fish and game commissioner.	Game protection	2 deer. Export of birds prohibited.
New Jersey	$10	County clerk	do	Export of upland game, except wild turkeys, prohibited. License not required for waterfowl, snipe, or mud hens.
New York	(a)	Forest, fish, and game commissioner.	State treasury	Export prohibited.
North Carolina	$10	Clerk superior court.	Game protection	50 quail.
North Dakota	$25	County auditor	(c)	Export prohibited.
Ohio	$15	County clerk	Game protection	50 of all game.

[a] Rate of State of nonresident.

[b] In Knox, Lincoln, Sagadahoc, and Waldo counties, and the townships of Brunswick, Freeport, and Harpswell in Cumberland County.

[c] 20 per cent State treasury, 70 per cent game protection, 10 per cent county auditor.

Details of Nonresident Licenses for hunting game—Continued.

State.	Fee.	By whom issued.	Disposition of fee.	Export limit; remarks.
Oregon	$10	Game and forestry warden.	State treasury	Market hunting. Export prohibited, except that Washington hunter may take one day's bag.
Pennsylvania	$10	County treasurer	50 per cent county treasury; 50 per cent game protection.	Export prohibited.
South Dakota	$25 (big game);	do	Game protection	3 deer, 1 elk, 1 buffalo, 1 sheep, 15 birds. County license. Licensee must be in charge of qualified guide.
	$10 (birds)	do	do	State license.
Tennessee	(a)	State game warden.	State treasury (?).	
Utah	$10	County fish and game warden.	State treasury	Export prohibited.
Virginia	$10	County clerk	Game protection	1 deer, 50 quail, 10 pheasants or grouse, 3 wild turkeys, 30 water fowl, 25 each or 100 in all of plover, snipe, sandpipers, willets, tatlers, and curlews.
Washington	$1	County auditor	Game protection	Export prohibited, except that Oregon hunter may take 1 day's bag. County license.
West Virginia	$15	State game warden.	State treasury	Export prohibited of deer, quail, ruffed grouse, pheasants, and wild turkeys.
Wisconsin	$25 (all game); $10 (small game).	Secretary of state	Game protection	2 deer, 2 rabbits, 2 squirrels, 50 birds.
Wyoming	$50	Justice of the peace.	do	2 deer, 2 elk, 2 antelope, 1 sheep, 1 goat. Licensee must employ guide.
British Columbia	$50	Any Government agent.		10 deer, 2 elk, 2 moose, 5 caribou, 5 goats, 5 sheep, under license. No birds.
Manitoba	$25	Minister of agriculture and immigration.		Export prohibited.
New Brunswick	$30 (moose and caribou).	Surveyor-general, chief game commissioner, any game warden.	Game protection	1 moose, 1 caribou.
	$30 (deer and game birds).	do		2 deer. License required only in Westmoreland County.

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[a] Rate of State of nonresidents.

Details of Nonresident Licenses for hunting game—Continued.

State.	Fee.	By whom issued.	Disposition of fee.	Export limit; remarks.
Newfoundland	$50 (caribou).	Minister of marine and fisheries, stipendiary magistrate, justice of the peace.	Game protection	3 caribou, under license and permit.
Northwest Territories.	$25 (all game); $15 (birds).	Game guardian		Trophies of 3 deer, 3 elk, 3 moose, 3 caribou (2 of each in Southeastern Assiniboia).
Nova Scotia	$40 (all game); $30 (moose); $10 (birds, hares, and rabbits).	Provincial secretary, county clerk, chief game warden.	Game protection	2 moose.
Ontario	$25	Chief warden	do	2 deer, 1 moose, 1 caribou, 100 ducks.
Quebec	$25 (general license); $20 (animals); $10 (birds); $1.50 a day (birds).	Commissioner of lands, forests, and fisheries.		Separate license required for shooting game birds in Gulf of St. Lawrence.

The corresponding details for resident licenses are shown in the following table:

Details of Resident Licenses for hunting game.

State.	Fee.	By whom issued.	Disposition of fees.	Remarks.
Colorado	$1.00	Commissioner or county clerk.	25 cents to clerk, 25 cents county fund, 50 cents game fund.	Expires Dec. 31.
Hawaii (Oahu)	5.00	Treasurer		Good for one year from date of issue.
Idaho	1.00	State warden, justice of peace.	Game protection	Expires Feb. 15.
Illinois	1.00	City, village, or county clerk.	do	Expires June 1; not required of one hunting on land which he owns or occupies.
Indiana	1.00	Game commissioner	do	Required for waterfowl, Oct. 1 to Nov. 10.
Maryland	1.00	County clerk	Schools.	Somerset County.
Michigan	.75	do	25 cents to clerk, 25 cents to State warden service, 25 cents to county warden service.	Deer only.
Minnesota	$1.00	County auditor	Game protection	Big game only; expires Dec. 31.

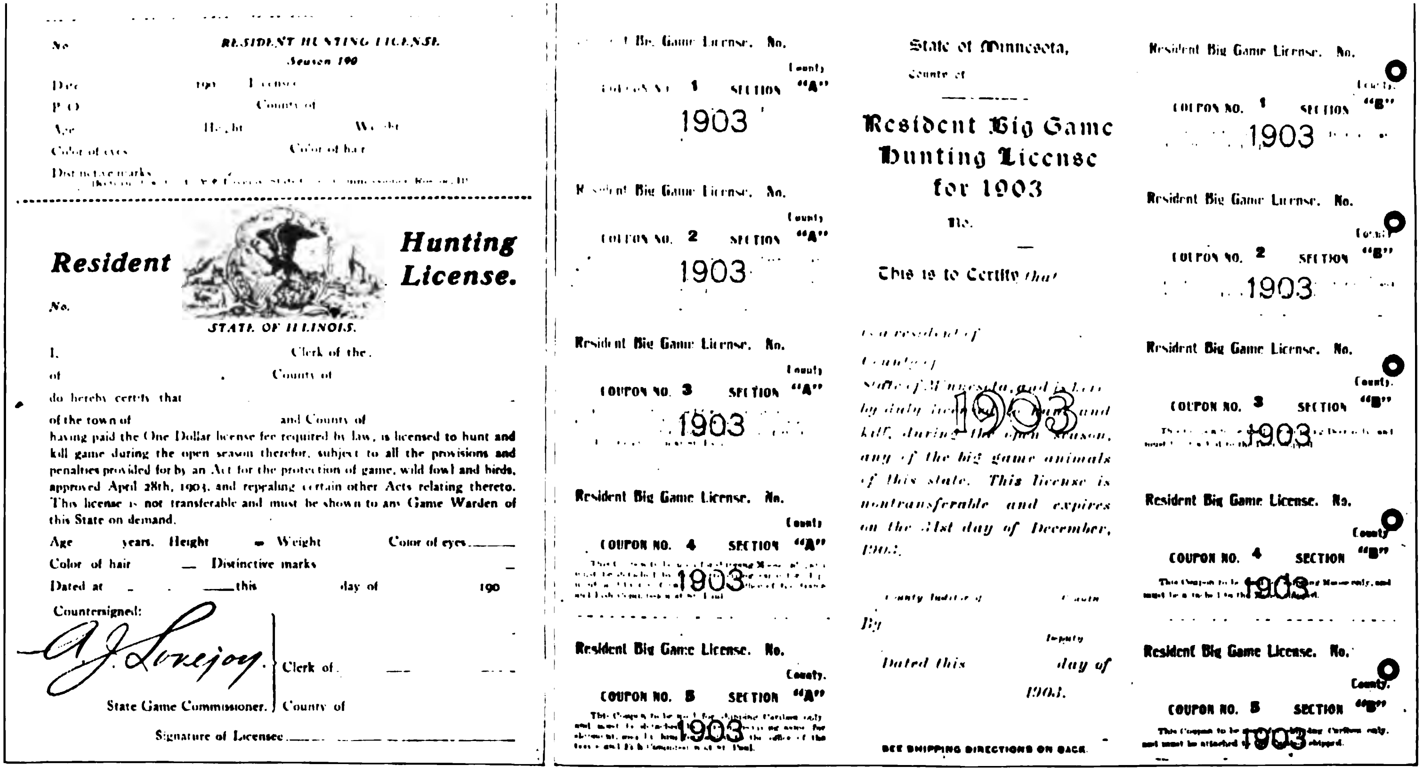
Details of Resident Licenses for hunting game—Continued.

State.	Fee.	By whom issued.	Disposition of fees.	Remarks.
Nebraska..........	1.00	Game commissioner	Schools...........	Necessary outside county of residence; expires Dec. 31.
North Dakota.....	.75	County auditor....	20 per cent to general fund, 10 per cent to county auditor, 70 per cent to wardens.	Not required by citizen hunting on his own land; expires Dec. 31.
South Dakota.....	1.00	County treasurer...	Game protection .	Big game only; county license; licensee must be in charge of qualified guide.
Washington.......	1.00	County auditor....	.....do............	County license.
Wisconsin..........	1.00	County clerk.......	Warden fund.....	
Wyoming.........	1.00	Justice of the peace.	Payment wardens and attorneys.	Big game; not required in county of residence; expires Dec. 31.
New Brunswick...	2.00	Chief game commissioner, any game warden.	Game protection .	Moose and caribou.
	.25			Deer and game birds in Westmoreland County.
Ontario............	5.00	Chief warden......	.....do............	Moose and caribou.
	2.00	.....do..............	.....do............	Deer.
Quebec..........	5.00	Commissioner of lands, forests, and fisheries.	....	3 deer and 3 caribou in excess of bag limit.

EXEMPTIONS.

One of the chief objections to nonresident license laws, and one of the features which usually causes the greatest hardship, is that requiring nonresidents who own land within the State to secure licenses. To meet this difficulty several States have made special exceptions in their laws. These exceptions merit mention with some detail to show the various solutions of the question which have been proposed.

Montana exempts taxpayers, and New Hampshire those who own real estate within the State to the value of $500. New Jersey excepts nonresident owners of freehold estates and their sons, and North Dakota allows nonresidents owning or cultivating quarter sections of land to take out resident licenses in the county where the land is situated. Pennsylvania, in the act of 1901, made an exception in favor of owners of real estate, but repealed the provision in 1903. South Carolina (law no longer in force) and Tennessee and West Virginia make exceptions in favor of landowners hunting on their own property. Tennessee makes a further exemption in the case of nonresidents who pay $100 in taxes in the State, and Virginia allows nonresident children and guests of resident landowners to hunt on the lands of their parents or hosts if the guest is accompanied by his host or a member of his family and the host receives no compensation, directly or indirectly.



No. RESIDENT HUNTING LICENSE.
Season 190

Dec 190 License
P. O. County of
Age Height Weight
Color of eyes Color of hair
Distinctive marks

Resident Hunting License.

No.

STATE OF ILLINOIS.

I, Clerk of the
of County of
do hereby certify that
of the town of and County of
having paid the One Dollar license fee required by law, is licensed to hunt and kill game during the open season therefor, subject to all the provisions and penalties provided for by an Act for the protection of game, wild fowl and birds, approved April 28th, 1903, and repealing certain other Acts relating thereto. This license is not transferable and must be shown to any Game Warden of this State on demand.

Age years. Height Weight Color of eyes
Color of hair Distinctive marks
Dated at this day of 190

Countersigned:
A. J. Lovejoy.
State Game Commissioner.

Clerk of
County of

Signature of Licensee

Resident Big Game License. No.
County
COUPON NO. 1 SECTION "A"
1903

Resident Big Game License. No.
County
COUPON NO. 2 SECTION "A"
1903

Resident Big Game License. No.
County
COUPON NO. 3 SECTION "A"
1903

Resident Big Game License. No.
County
COUPON NO. 4 SECTION "A"
1903

Resident Big Game License. No.
County
COUPON NO. 5 SECTION "A"
1903

State of Minnesota,
County of

Resident Big Game Hunting License for 1903

No.

This is to Certify that

is a resident of
County of
State of Minnesota, and is hereby duly licensed to hunt and kill, during the open season, any of the big game animals of this state. This license is nontransferable and expires on the 31st day of December, 1903.

1903

County Auditor of County
By
Deputy
Dated this day of
1903.

SEE SHIPPING DIRECTIONS ON BACK.

Resident Big Game License. No.
County
COUPON NO. 1 SECTION "B"
1903

Resident Big Game License. No.
County
COUPON NO. 2 SECTION "B"
1903

Resident Big Game License. No.
County
COUPON NO. 3 SECTION "B"
1903

Resident Big Game License. No.
County
COUPON NO. 4 SECTION "B"
1903

Resident Big Game License. No.
County
COUPON NO. 5 SECTION "B"
1903

RESIDENT LICENSES, ILLINOIS AND MINNESOTA.

Illinois license 5¼ by 7¼ inches, printed on light-blue glazed paper and mounted on linen.
Minnesota license 8 by 9 inches, printed on buff cardboard with shipping directions on back; coupons with metal eyelets.

In Maryland special exceptions regarding landowners prevail in some of the counties. Dorchester County excepts nonresident landowners or their relatives, and relatives or connections by marriage of residents; Kent exempts nonresidents owning lands, and tenants in lawful possession of real estate; and under an act passed in 1904 regulating hunting on the Patuxent River those persons are considered bona fide residents of the State that belong to any incorporated hunting club whose membership does not exceed 30, and which owns or leases real estate within a mile of the river, and has improved its property by a club-house.

Other exceptions are based on other considerations. Idaho requires no license from women, and prohibits children under 12 from obtaining licenses. Wyoming excepts bona fide minors; North Dakota, children under 16 if they have the written consent of their parents or guardians to hunt; and Washington, in the law of 1901, excepted boys under 16, a provision which caused the law to be declared unconstitutional by the circuit court of Spokane County. Washington County, Md., makes the provision of its license law inapplicable to hunting along the Potomac River, and exempts residents of the District of Columbia as well as Maryland.

Illinois inserted a provision in its law permitting nonresidents to hunt without a license on the lands of another by invitation. This proviso was declared void by the attorney-general of the State, but merely because of ambiguity, owing to its location in the law. A similar exemption of guests of residents or landowners is in force in many counties of Maryland, and visiting sportsmen often secure invitations instead of licenses.[a] Kent County, Md., issues licenses at one-third the regular rate to nonresidents invited by landowners.

In some of the Canadian provinces exceptions are made in favor of army and navy officers. For example, British Columbia does not require licenses of officers of the army and navy or of the Canadian militia in actual service, Newfoundland allows officers of British war vessels stationed on the coast for the protection of fisheries to employ unlicensed guides and to hunt caribou without license, and Nova Scotia excepts officers stationed at Halifax, provided they are members of the Game and Inland Fishery Protection Society.

Some of these exemptions have practically nullified the laws or made them very difficult of enforcement. Thus it was found in Pennsylvania that nonresidents would purchase a few acres of wild land to secure immunity from the license law, and the secretary of the game commission of that State advised in his report for 1902 (p. 5) that the nonresident hunter should be required to pay the license fee, as in adjoining States, regardless of the ownership of property.

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[a] Guests of landowners require no licenses in any of the counties of the State except Allegany, Caroline, Dorchester, Garrett, Kent, Somerset, Talbot, and Worcester.

The North Dakota exemption in favor of nonresidents owning or cultivating a quarter section of land has been made use of to evade the payment of the license fee. The game warden of the second district of this State says:

> I believe that all nonresident hunters should be required to pay the full fee of $25, and see no good reason why an exception should be made in favor of those who are the owners of land in the state. A fraudulent use, I think, is frequently made of this latter clause, as it is an easy matter to temporarily transfer the title of land in order to evade the payment of $25, for a permit. It would only be fair in case all nonresidents are charged the $25 fee if they were granted some privileges in regard to shipping game out of the state.

Of the Wyoming provision exempting from the payment of the resident license fee citizens hunting in their own counties, the State game warden says in his report for 1903 (pp. 3-4):

> The law as it stands is difficult to enforce, produces but little revenue and is useless as a means of identification.
>
> With a nonresident gun license of fifty dollars, the temptation is strong for unscrupulous hunters to sneak in from adjoining States and pose as citizens of Wyoming; and an officer must rely upon his acquaintance with the people of his own county for detection of such fraud.

Whatever may be said of the injustice of requiring nonresidents to take out licenses to hunt on their own property or on the lands of a club to which they may belong, the contention that such a provision is unconstitutional in depriving a person of his property has not been sustained in the single case which has been tried in the higher courts. (*In re* Eberle, see p. 48.)

Another provision frequently regarded as an unnecessary hardship is that even after securing a license nonresidents are sometimes prohibited from carrying home any of the game which they secure. Such restrictions are in force in Delaware, Florida, Kentucky, Maryland, Michigan, New Jersey, North Dakota, Pennsylvania, Utah, and West Virginia, and also in Manitoba. In other States which issue nonresident licenses an exemption in the nonexport law allows the holder to take with him out of the State a certain amount of game for his own use, usually on condition that it shall be carried openly. Some such provision seems no more than just when the State exacts a fee of from $5 to $50 for the privilege of securing game, which, in some cases at least, can not be fully enjoyed unless the owner can take it home.

The absence of such a provision and the failure to permit nonresident landowners to hunt on their own property account for most of the irritation aroused by nonresident license laws. The shipping privilege can be easily arranged and has already been recognized by most States. The other obstacle is not so easily overcome, and a satisfactory solution has not as yet been devised.

OBJECTS OF HUNTING LICENSES.

NONRESIDENT LICENSES.

The objects of nonresident licenses, although variously stated, may be practically reduced to two: (1) To restrict hunting, especially on the part of those who are not citizens of the State, and (2) to raise funds for game protection by requiring nonresidents to contribute to the expense of preserving the game. The annoyances occasioned by hunting on the part of irresponsible persons who are not citizens of the State are by no means peculiar to the present day. They were evidently experienced by the early colonists, as shown by the preamble of the North Carolina law of 1768, in which the reasons for discriminating against nonresidents are quaintly expressed as follows:

> Whereas, by the before recited act, [Laws of 1745, Chap. III], persons who have no settled habitation, or not tending 5000 cornhills are prohibited from hunting, under the penalty of five pounds and forfeiture of his gun; which by experience has been found not to answer the purposes intended by the said act; many disorderly and dissolute persons having no habitation of their own, still continue to hunt on the King's waste and the lands of other persons, and kill deer, and leave the carcasses in the woods, by which means the wolves, bears and other vermin, are fed and raised; to the great damage of many of the inhabitants of this Province; and the fines being difficult of recovery, by means of persons having no property of their own, assembling in great numbers and camping in the woods, and kill deer, burn and destroy the range, burn fences and commit many other injuries to the inhabitants of this Province; and associate for the mutual protection and defence of each other, against any person or persons who shall attempt to execute any precept on any of them: * * *

The necessity for restricting hunting is now greater in some States than in others, particularly in those which are likely to be overrun with hunters from large cities in adjoining States. New Jersey affords a striking example of this kind. A State of comparatively small area, with New York City on her northern border and Philadelphia on her southwestern border, her stock of game is peculiarly subject to depletion by hunters from these cities, and a nonresident license fee affords a means of preventing many of them from hunting in the adjoining counties within her borders. The fact that Pennsylvania, Delaware, and other States had adopted the license system induced New Jersey to follow their example. The reason for this course was thus expressed in the preamble to the act of 1902 (Laws of 1902, chap. 263):

> Whereas, Sister states have, by legislation, required all non-residents (including residents of the state of New Jersey) to take out licenses before hunting or gunning in such states, respectively, and imposed license fees therefor and provided for the punishment for such as should violate the provisions of such acts; now, therefore,
>
> *Be it enacted by the State and General Assembly of the State of New Jersey:*
>
> 1. Every non-resident of this state shall be required to take out a license before he shall begin hunting or gunning in this state, * * *

Pennsylvania in 1903 further developed the protection idea by requiring not only every nonresident, but also every unnaturalized foreign-born resident of the Commonwealth to take out a license from the treasurer of the county in which he proposed to hunt, for which he must pay a fee of $10. (Acts of 1903, p. 178.) This provision, which has recently been adopted by Louisiana, seems to offer a practical solution of the problem of controlling the ever increasing number of foreigners of certain classes who destroy birds and game of all kinds in the neighborhood of large cities despite laws and wardens.

The principle on which the nonresident license is founded, besides the general one of protection of the game from irresponsible and unidentifiable hunters on which all hunting licenses are based, is the preservation of the benefits of residence within a community for the use of its own citizens. The game of a State is held to belong to the people of the State and is preserved primarily for their own use. When, therefore, nonresidents desire to enjoy the privileges of residents they are required to pay a reasonable fee for such concession on the part of the State. This requirement is the one which is considered more important by some States. Thus Illinois in the game law of 1901, section 26, declares:

> For the purpose of increasing the game-protection fund, and preventing unauthorized persons from killing game and birds, no person, not a resident of the State of Illinois, shall at any time hunt, pursue or kill, with gun, any of the wild animals, fowls or birds that are protected during any part of the year without first having procured a license so to do, * * *

In several States, notably Maine, North Carolina, Washington, and Wyoming, the State depends largely upon the income from this source for game protection; in most States although the returns are considerable they do not by any means constitute the chief source of income for the game-protection fund. Efforts have been made to ascertain the income derived from licenses in the several States, as well as in the Provinces of Canada, for the years 1902 and 1903. Difficulty, however, has been encountered in obtaining satisfactory statistics owing chiefly to the different methods of issuing licenses and the fact that in some States the issue is intrusted to local officers, so that the full returns for the State are practically inaccessible. The following table shows the number of licenses and amount of fees received therefor in 22 States and 6 Provinces during the past two years. In several States license laws were not in force in 1902, and in others statistics for 1902 are not available, although they have been furnished for 1903.[a]

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[a] The figures for Washington are inseparable from those for resident licenses and are given in the table on p. 38. The States and Provinces from which no returns were received are: New York, Pennsylvania, Florida, Indiana, Iowa, South Dakota, Oregon, Hawaii, British Columbia, and Quebec. In New York no licenses were issued, and in Oregon the law requires none except for market hunting by nonresidents. The receipts were probably small in all the other States except possibly in South Dakota.

Nonresident Licenses issued in 1902 and 1903.

State.	Rate.	1902.			1903.			Remarks.
		No.	Amount.	Total amount.	No.	Amount.	Total amount.	
Colorado	$25.00				29	$725.00	$746.00	General license.
					5	21.00		Bird license, $1 per day ($2 first day).
Delaware	5.00 2.00	246	$791.00	$791.00	315	1,027.00	1,027.00	
Idaho	25.00	(a)	(a)	(a)	20	500.00	1,735.00	
	5.00				247	1,235.00		
Illinois	10.00	570	5,985.00	5,985.00	250	3,750.00	3,750.00	Rate in 1903, $15.
Kentucky	25.00	4	100.00	100.00				4 counties.
Maine	15.00	(a)	(a)	(a)	1,697	25,455.00	25,455.00	
Maryland				151.50			131.50	Total number, 25 in 1902, 25 in 1903.
Caroline	4.50	2	9.00		2	9.00		
Cecil	5.00	16	80.00		14	70.00		
Dorchester	5.00				1	5.00		
Howard	7.50	3	22.50		3	22.50		
Kent	5.00	2	10.00		5	25.00		
Montgomery	15.00	2	30.00					
Michigan	25.00	53	1,325.00	1,325.00	45	1,125.00	1,125.00	
Minnesota	25.00				131	3,275.00	5,295.00	
	10.00				202	2,020.00		
Montana	25.00	33	825.00	970.00	61	1,525.00	1,690.00	
	15.00	9	145.00		11	165.00		
Nebraska	10.00	64	640.00	640.00	84	840.00	840.00	
New Hampshire	10.00	(a)	(a)	(a)	135	1,350.00	1,350.00	
New Jersey	10.00				301	3,010.00	3,010.00	
North Carolina	10.00	(a)	(a)	(a)	911	9,110.00	9,110.00	
North Dakota	25.00				83	2,075.00	3,075.00	First district.
	25.00				40	1,000.00		Second district.
Ohio	25.00	15	375.00	375.00	17	425.00	425.00	
Tennessee		(a)	(a)	(a)	40	200.00	325.00	Total includes 5 market hunters' licenses, $125.
Utah	10.00	(a)	(a)	(a)	30	300.00	300.00	
Virginia[b]	10.00	(a)	(a)	(a)	254	2,540.00	2,540.00	
West Virginia	15.00				29	435.00	435.00	
Wisconsin	25.00	298	7,325.00	9,925.00	361	9,025.00		All game.
	10.00	260	2,600.00		298	2,980.00	12,005.00	Small game.
Wyoming	50.00				158	7,900.00	7,900.00	
Manitoba	25.00	36	900.00	900.00	30	750.00	750.00	
New Brunswick	30.00	287	8,610.00	8,610.00	338	10,140.00	10,140.00	
Newfoundland	100.00	46	4,600.00	4,600.00	72	3,600.00	3,600.00	Rate in 1903, $50.
Northwest Ter.	15.00	19	285.00	285.00	17	255.00	255.00	
Nova Scotia	40.00	83	1,320.00	1,510.00	30	1,200.00	1,380.00	
	10.00	19	190.00		18	180.00		
Ontario	25.00	200	5,000.00	5,000.00	259	6,475.00	6,475.00	

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[a] No law in force.

[b] Based mainly on a report by L. T. Christian in the Richmond Times-Dispatch of August 21, 1904, supplemented by a few reports from county clerks. Following are the number of licenses issued in each county in 1903: Albemarle, 2; Alexandria, 13; Alleghany, 1; Augusta, 4; Amelia, 16; Bath, 4; Brunswick, 6; Bland, 4; Buckingham, 9; Caroline, 18; Charlotte, 2; Culpeper, 2; Dinwiddie, 1; Essex, 7; Fairfax, 5; Fauquier, 2; Franklin, 2; Frederick, 4; Gloucester, 2; Greensville, 4; Henrico, 8; Isle of Wight, 1; James City, 2; King William, 10; Louisa, 4; Lunenburg, 6; Middlesex, 13; Montgomery, 1; New Kent, 3; Nottoway, 2; Orange, 8; Page, 4; Pittsylvania, 2; Prince George, 12; Princess Anne, 44; Prince William, 1; Richmond, 5; Roanoke, 2; Shenandoah, 1; Smyth, 2; Southampton, 1; Spottsylvania, 1; Stafford, 5, and Sussex, 13. Total, 254. The only counties not heard from are Accomac, Giles, Hanover, Mecklenburg, and Powhatan.

The foregoing table shows that the number of licenses issued was as follows: In 1902, 1,572 licenses in 9 States and 640 licenses in 6 Canadian Provinces, or a total of 2,212 licenses in 15 States and Provinces; in 1903, 5,779 licenses in 21 States and 764 licenses in 6 Canadian Provinces, or a total of 6,543 licenses in 27 States and Provinces. While the receipts from nonresident licenses in 1903 exceeded those of the previous year, they ran above $1,000 in only 14 States and 4 Provinces, and exceeded $5,000 in only 5 States and 2 Provinces. Maine collected the largest amount ($25,455) and Wisconsin the next largest ($12,005). The smallest amount was $131, collected in Maryland, where licenses were issued in only 5 of the 23 counties.

Investigation of the disposition of the funds will show that in most cases receipts from licenses are utilized for the protection of game. Maine, in 1903, provided that the money received from nonresident licenses should be expended for protection of moose and deer and for compensation for "actual damage done growing crops by deer." In a few States, however, the proceeds are turned into the general treasury or the school fund. Thus, in New York, West Virginia, Kentucky, Tennessee, Oregon, and Utah they are covered into the general treasury, and in Georgia into the county treasury. In Pennsylvania one-half of the total receipts is paid into the county treasury. In North Dakota 20 per cent goes into the general treasury, 10 per cent is paid to the county auditor, and 70 per cent is added to the game fund. In Maryland (except in a few counties) and Nebraska the receipts are turned over to the school fund. Again, examining the table from this standpoint, it will be noticed that the States which turn the money over to the school fund or to the general treasury are the ones which show the smallest returns. Thus, in 1903, Maryland collected only $131 and Nebraska $840 for the school fund. Utah collected $300 and West Virginia $435 for the general treasury. Where the money is not applied to the protection of game, which is the ultimate source of this income, less interest seems to be taken in enforcing license laws, and the license system as a source of income makes but a small showing. Again, the experience of some States shows that interest is apt to be lax if the proceeds from the sale of licenses are turned into a general State fund instead of being retained in the county in which they accrue, even though such general fund is devoted to the enforcement of game laws, and it has been suggested as desirable to allow each county to use for its general expenses at least 50 per cent of the proceeds, and thus give it a direct financial interest in the amount raised.

RESIDENT LICENSES.

Resident licenses, unlike those issued to nonresidents, are not intended so much to restrict hunting as to regulate it. The chief uses they subserve are raising funds for the protection of game and providing a system of identifying hunters. And by requiring everyone who hunts to be registered, they may afford indirectly a valuable means of collecting statistics not otherwise obtainable, concerning the number of persons hunting in the State, approximately the amount of big game killed, and the principal hunting places.

With the exception of a small fee allowed to the officer issuing the license, usually prescribed in addition to the regular license fee, the proceeds from resident licenses are used for the protection of game. Apparently the only important exceptions are in North Dakota and Michigan. In North Dakota, but 70 per cent is devoted to game protection, 10 per cent being paid to the auditor and 20 per cent to the general treasury of the State. In Michigan 25 cents is allowed the clerks for issuing the licenses, so that the cost to the State of collecting the fees is 33 per cent of the total resident tax.

The following table shows the number of resident licenses issued in each State in 1902 and 1903 and the amounts paid therefor:

Resident Licenses issued in 1902 and 1903.[a]

State.	Rate.	1902.		Rate.	1903.		Remarks.
		No.	Amount.		No.	Amount.	
Colorado	....	....	....	$1.00	15,184	$15,184.00	
Hawaii	$5.00	....	....	5.00	....	....	
Idaho	....	....	....	1.00	12,370	12,370.00	
Illinois	....	....	....	1.00	95,000	95,000.00	
Indiana	....	....	....	1.00	....	....	
Michigan	$0.75	18,621	$13,965.75	.75	19,061	14,295.75	
Minnesota	.25	....	....	1.00	8,910	8,910.00	
Nebraska	1.00	8,348	3,348.00	1.00	3,744	3,744.00	
North Dakota	.75	....	....	.75	6,518	4,888.50	First district.
				.75	5,056	3,792.00	Second district; total $8,680.50.
South Dakota	1.00	....	....	1.00	....	....	
Washington	1.00	....	....	1.00	14,982	14,982.00	
Wisconsin	1.00	72,635	72,635.00	1.00	78,164	78,164.00	
Wyoming	1.00	....	....	1.00	299	299.00	
New Brunswick	2.00	1,571	3,142.00	2.00	1,858	3,716.00	Moose and caribou.
Ontario	5.00	150	750.00	5.00	153	765.00	Do.
	2.00	5.165	10,330.00	2.00	5,707	11,414.00	Deer.
Quebec	5.00	....	....	5.00	....	....	

[a] In Maryland special licenses were issued in some of the counties as follows: Anne Arundel, 1902, 11 pushers, $22; 1903, 10 pushers, $20; Cecil, 1902, 24 sink box, $480; 67 sneak boat, $335; 1903, 19 sink box, $380; 69 sneak boat, $345; Harford, 1902, 40 sink box, $800, 68 sneak boat, $340; 1903, 34 sink box, $680; 51 sneak boat, $255.

COMPARISON OF STATISTICS.

A comparison of the two preceding tables shows some interesting facts. Although the returns are incomplete, still they suggest some important questions in regard to (1) receipts, (2) number of licensed hunters, (3) number of big game licenses, and (4) statistics of former years.

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[a] Maine is the only State in this list that does not issue resident licenses.

(1) *Receipts.*—The receipts from licenses exceeded $10,000 in nine States: Colorado, Idaho, Illinois, Maine,[a] Michigan, Minnesota, North Dakota, Washington, and Wisconsin. Notwithstanding the difference in the fees charged, a nominal fee of $1 for resident licenses and an average fee of $10 to $25 for nonresident licenses, the amount ordinarily collected from residents is far in excess of that received from nonresidents. Thus, in Wisconsin in 1903 the returns from resident licenses ($78,164) were more than six times as great as those from nonresident licenses ($12,005); in Colorado, where the amounts were $15,184[a] and $746, respectively, the resident were nearly twenty-one times as large as the nonresident; and in Illinois, the amounts being $95,000 and $3,750, respectively, more than twenty-five times as large.

(2) *Number of licensed hunters.*—In the following table are shown the number of licenses issued (indicating the number of licensed hunters) and the amounts received therefrom (see Pl. V) in each of the 10 States for which statistics are available for both resident and nonresident licenses:

Number of Licensed Hunters and Receipts from Licenses, 1903.

State.	Resident.	Nonresident.	Total number.	Total fees.
Colorado	15,184	34	15,218	$15,930
Idaho	12,370	267	12,637	14,105
Illinois	95,000	250	95,250	98,750
Michigan	19,061	45	19,106	15,421
Minnesota	8,910	333	9,243	14,205
Nebraska	3,744	84	3,828	4,584
North Dakota	11,574	123	11,697	11,756
Washington	14,982	(a)	14,982	14,982
Wisconsin	78,164	659	78,823	90,169
Wyoming	299	158	457	8,199
Total	259,288	1,953	261,241	288,101

[a] Nonresident licenses inseparable from resident licenses.

The most interesting fact brought out by this table is the total number of licenses issued. This number shows that in the above-mentioned ten States more than a quarter of a million hunters were licensed during the past year. This total, however, is less than the actual number of hunters in these States, for the reason that in Michigan and Wyoming no licenses are required from residents for anything except big game, and in Nebraska and Wyoming a resident is not required to secure a license unless he shoots outside his own county.

The only State which shows larger returns from nonresident than from resident licenses is Wyoming, which has a very high nonresident fee of $50, and requires resident licenses only in the case of persons

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[a] Deducting the fees for issue the amount was $9,890.

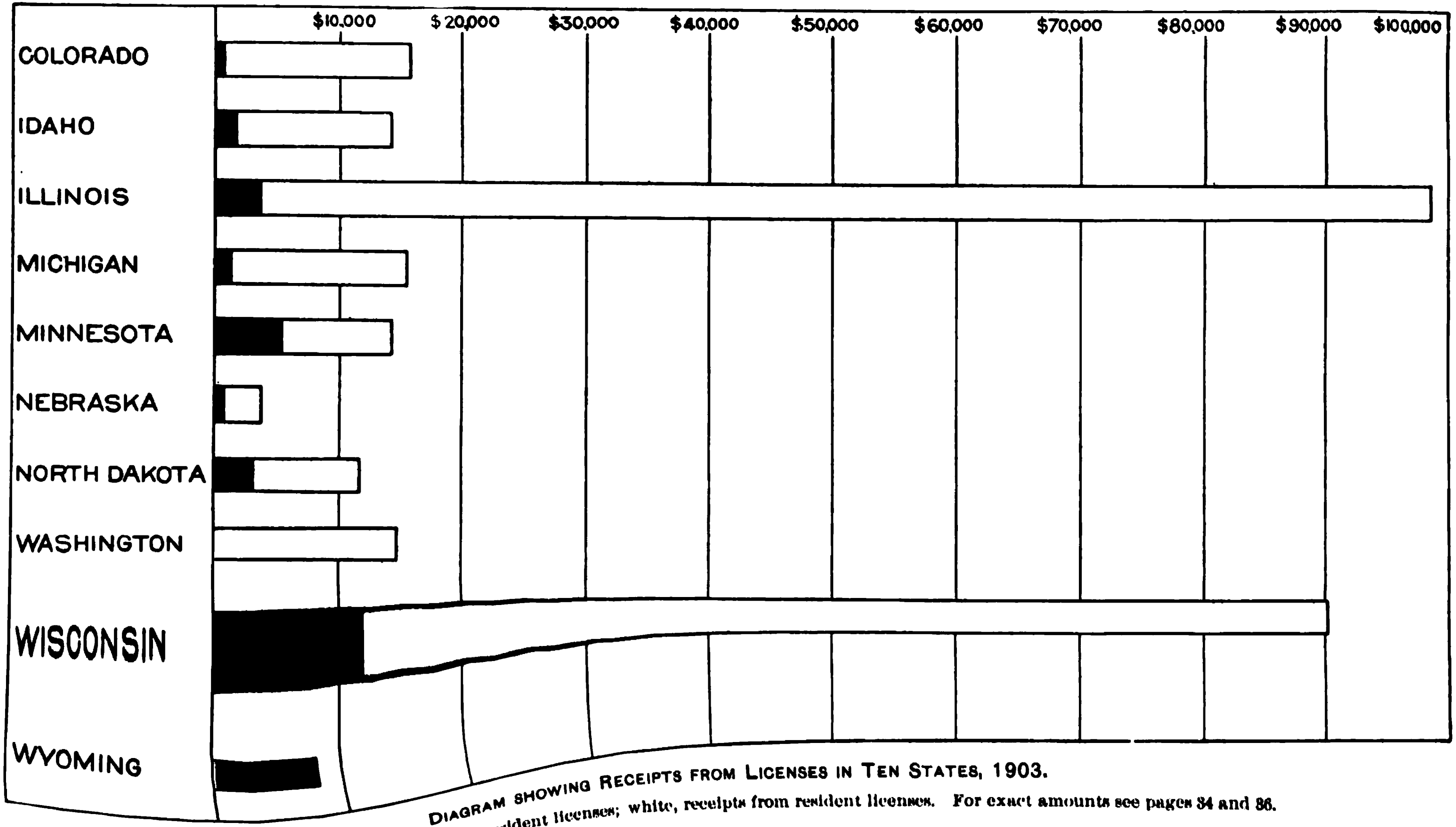

DIAGRAM SHOWING RECEIPTS FROM LICENSES IN TEN STATES, 1903.

Black indicates receipts from nonresident licenses; white, receipts from resident licenses. For exact amounts see pages 84 and 86.

hunting big game outside of the county of residence (see p. 32). These conditions in a State so thinly settled and with large counties would naturally make the returns from resident licenses very small.

(3) *Number of big game licenses.*—As some of the States require separate licenses for big game and for game birds, it is possible to ascertain approximately the number of nonresident licenses issued for hunting big game. The figures for 9 States and 4 Provinces are shown in the table following:

Nonresident Licenses for Big Game issued in 1903.

State.	Licenses.	Fees.	State.	Licenses.	Fees.
Colorado	29	$725	Wyoming	158	$7,900
Idaho	20	500	New Brunswick	338	10,140
Maine	1,697	25,455	Newfoundland	72	3,600
Michigan	45	1,125	Nova Scotia	30	1,200
Minnesota	131	3,275	Ontario	259	6,475
Montana	61	1,525			
New Hampshire	135	1,350	Total	3,336	72,295
Wisconsin	361	9,025			

From this table are omitted the returns from Nebraska, North Dakota, Utah, Washington, West Virginia, Manitoba, and the Northwest Territories, in which licenses for big game can not be separated from those for game birds. Several other States, in which considerable big game hunting is done, are also necessarily omitted—South Dakota, British Columbia, and Quebec, from which no reports are available, and Vermont, New York, California, and Oregon, in which no general hunting licenses are issued. But notwithstanding the incompleteness of the statistics, several facts of interest are brought out. Thus, it appears that in the nine States and four Provinces in the table 3,336 nonresident big game licenses were issued at a cost of $72,295, that Maine issued more than one-half of these licenses and collected more than one-third of the fees, and that New Brunswick stood second in point of license receipts. If we assume that all the nonresident licenses in Nebraska, North Dakota, Utah, West Virginia, Manitoba, and the Northwest Territories were issued for big game hunting, the totals would only be increased to 3,649 and $78,120, respectively, leaving but six important States—New York, South Dakota, California, Oregon, Washington, and British Columbia, in addition to those in the South—from which no returns are available. In other words, nearly 60 per cent of the 5,779 nonresident licenses issued in the United States and most of those issued in Canada in 1903 were for hunting big game.

On the other hand, if the resident licenses could be separated in the same way, the results would be very different. Fortunately, in five cases these figures are available, as resident licenses are issued only for big game in Michigan, Minnesota, Wyoming, New Brunswick, and Ontario. In 1903 there were 19,061 resident licenses issued in Michigan, 8,910 in Minnesota, 299 in Wyoming, 1,858 in New Brunswick, and 5,860 in Ontario, making a total of 35,888, or nearly ten times as many as were issued to nonresidents in the nineteen States and Provinces mentioned above. The amount paid for the resident licenses, however, was only $39,400, or about 50 per cent of the fees for the nonresident licenses.

(4) *Statistics of former years.*—Still another inquiry suggested by the table is whether or not the figures for 1903 are abnormal. On this point few statistics are available for a term of years, but in Michigan and Ontario the returns are complete for the entire time the resident-license system has been in force. Michigan inaugurated its license system in 1895; Ontario began to issue nonresident licenses in 1888 and resident licenses in 1896.[a] The rates are about the same—$25 for nonresidents in each case and 75 cents for residents in Michigan and $2 in Ontario. Situated as they are, adjoining one another, with much the same kind of hunting, this State and Province are admirably adapted for a comparison of this kind.

Following are the figures for each year since 1895:

Number of Licenses issued in Michigan and Ontario,[a] 1895-1903.

Year.	Michigan.			Ontario.		
	Resident.	Nonresident.	Total.	Resident.	Nonresident.	Total.
1895	14,477	22	14,499	....	60	....
1896	12,904	20	12,924	3,452	49	3,501
1897	11,867	44	11,911	2,300	53	2,353
1898	11,585	48	11,633	3,300	52	3,352
1899	12,758	93	12,851	3,917	80	3,997
1900	13,366	77	13,443	4,200	90	4,290
1901	15,687	49	15,736	5,090	100	5,190
1902	18,621	53	18,674	5,165	200	5,365
1903	19,061	45	19,106	5,707	259	5,966
Total	130,326	451	130,777	33,131	943	34,014
Average	14,481	50	14,531	[b] 4,141	105	[b] 4,502

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[a] Ontario also established a $5 resident license for moose and caribou in 1900. Comparatively few of these licenses have been issued—105 in 1900, 150 in 1902, and 153 in 1903—and as Michigan has no corresponding license, they have been omitted from this table.

[b] Average for 8 years, 1896-1903.

This table shows that the total number of hunters licensed in Michigan since 1895 was 130,777, and in Ontario since 1896, 34,014. Although the number varies from year to year, there has been a steady increase in resident licenses for six or seven years—in Michigan from 11,585 in 1898 to 19,061 in 1903, and in Ontario from 2,300 in 1897 to 5,707 in 1903. The number of nonresident licenses shows considerable fluctuation—in Michigan from 20 in 1896 to 93 in 1899, in Ontario from 49 in 1896 to 259 in 1903.

While the issue of nonresident licenses in Ontario has increased regularly and to larger proportions than in Michigan, the issue of resident licenses has always been considerably smaller. This is explained in part by the fact that in 1896 the government began the issue of free settlers' permits, allowing one member of a family to kill two deer for food purposes. In 1897, 2,300 of these permits were issued, in 1898, 2,404, and in 1899, 2,665. But even if the settlers' permits and resident licenses are combined, the total will still be less than one-half the number of resident licenses issued in Michigan for the same year.

LIMITATIONS OF THE LICENSE SYSTEM.

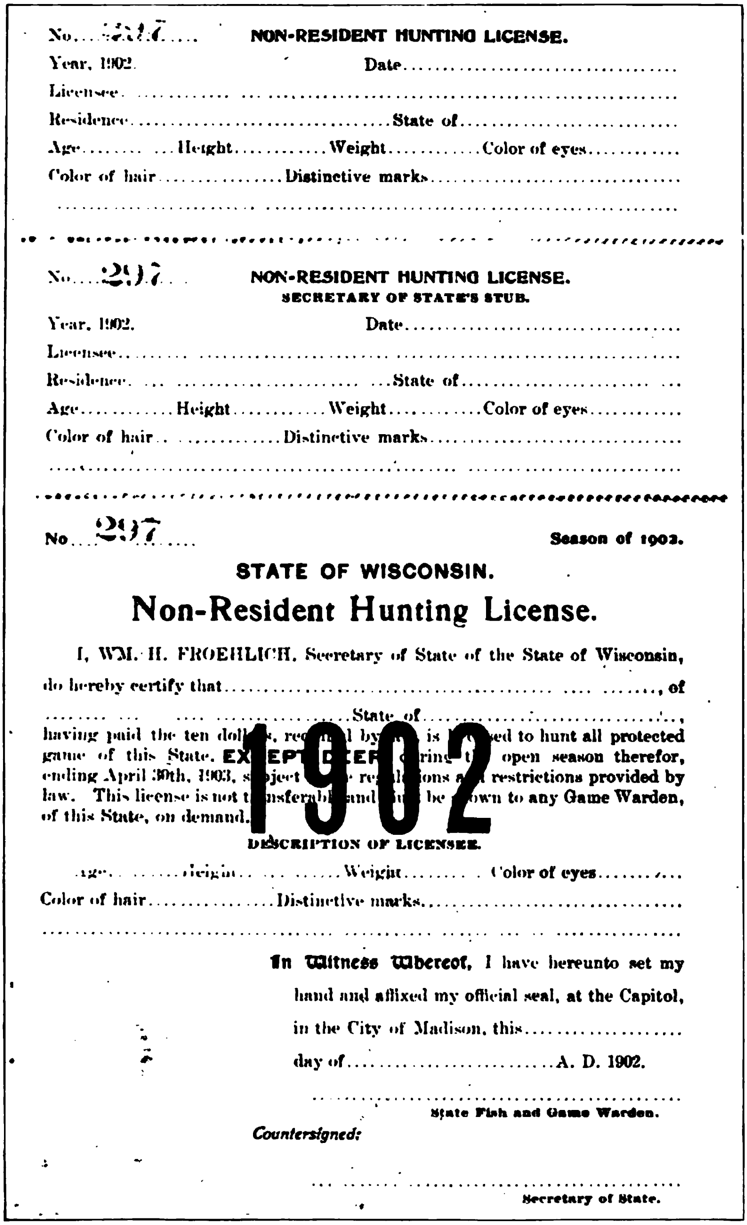
In many States the license system is still in an experimental or transitional stage, and its possibilities as a source of revenue, a check on indiscriminate hunting, and incidentally as a means of collecting important statistics concerning hunting, have not been fully realized. It is, moreover, incomplete in some States, where it has not been extended to residents or does not cover all kinds of game. These inequalities are inherent in any new scheme and may be expected to disappear in due time. Certain other inherent difficulties, however, give rise to problems which are not so readily solved. These may be grouped under three heads: Special privileges, cost of collection, and enforcement.

SPECIAL PRIVILEGES.

Much of the adverse criticism provoked by the license system has been caused both by the privileges granted and by those withheld by law. Certain exemptions already referred to (pp. 30–32) arouse hostility to the system and undoubtedly interfere with its operation. On the other hand, failure to accord reasonable privileges, which might be granted without impairing the value of the law, has created irritation and intensified opposition. The exceptional privileges granted residents of certain limited districts or members of certain clubs are regarded, perhaps with justice, as class legislation. The omission to exempt taxpayers from the requirements of the law, however, sometimes works injustice and arouses strong criticism. Both of these extremes are at least of doubtful constitutionality, and seem to prevent the best working of the system. Exemption of landowners or taxpayers is in many cases necessary, but to devise a clearly constitutional means for accomplishing it without interfering with the main object of the law is one of the difficult problems still to be solved. A lesser evil, which can be more easily remedied, is the policy established in some States of exacting a large fee for a hunting license and refusing the licensee the privilege of carrying home even a limited amount of the game or trophies he has secured. This is a source of irritation that apparently serves no useful purpose, and might easily be removed.

COST OF COLLECTION.

Although comparatively unimportant, the expense of printing licenses is an item that must be taken into account in considering the cost



No. 297 **NON-RESIDENT HUNTING LICENSE.**

Year, 1902. Date........

Licensee........

Residence........ State of........

Age........ Height........ Weight........ Color of eyes........

Color of hair........ Distinctive marks........

....

No. 297 **NON-RESIDENT HUNTING LICENSE.**

SECRETARY OF STATE'S STUB.

Year, 1902. Date........

Licensee........

Residence........ State of........

Age........ Height........ Weight........ Color of eyes........

Color of hair........ Distinctive marks........

....

No. 297 **Season of 1902.**

STATE OF WISCONSIN.

Non-Resident Hunting License.

I, WM. H. FROEHLICH, Secretary of State of the State of Wisconsin, do hereby certify that........, of .... State of........, having paid the ten doll s, re l by is ed to hunt all protected game of this State, **EX EP D ER** ring t open season therefor, ending April 30th, 1903, s bject re l ons restrictions provided by law. This license is not t nsferab and be own to any Game Warden, of this State, on demand.

1902

DESCRIPTION OF LICENSEE.

Age........ Height........ Weight........ Color of eyes........

Color of hair........ Distinctive marks........

....

In Witness Whereof, I have hereunto set my hand and affixed my official seal, at the Capitol, in the City of Madison, this........ day of........ A. D. 1902.

....

State Fish and Game Warden.

Countersigned:

....

Secretary of State.

NONRESIDENT COUPON LICENSE OF WISCONSIN.

Size 5 by 8¼ inches, printed on light-blue glazed paper, and mounted on linen. (The $25 nonresident deer license is similar but bright red.)

of collection of license fees. Sometimes it becomes a considerable item, especially in the case of a modern coupon license mounted on cloth and furnished with metal eyelets for attaching the coupons to the game killed (see Pl. VI). The method of issuing a license varies according to the State, and the fees allowed officers that issue them are strikingly different. When licenses are issued by game commissioners or wardens who receive no special fees the cost of issue is merely the added cost of clerical service. The usual method of issuing them through county officers who are allowed a certain percentage, or a specified fee, for their work oftentimes greatly reduces the income, particularly in the case of resident licenses, in which the fees for issue are large in proportion to amount of the license. In Wyoming the rate is 5 per cent of the license fee, or 5 cents for issuing a resident license and $2.50 for a $50 nonresident license. In North Dakota the rate is 10 per cent. In Michigan a clerk is allowed a uniform fee of 25 cents for issuing the 75 cent resident license and the $25 nonresident license, or 33 per cent in one case and 1 per cent in the other. Thus in 1903 it cost the State only $11.25 to collect $1,125 from nonresidents, while it cost $4,765 to collect $14,296 from residents. As the cost of issue is frequently deducted from license receipts, the actual income is seriously reduced. The cost of collecting license money should in all cases be reduced to a minimum, in order to insure adequate funds for game protection, and if the percentage plan is adopted the maximum fee allowed for issuing the license should be limited to $1.

ENFORCEMENT.

Penalties for hunting without a license, like fees for issuing licenses, exhibit considerable variation. Thus the penalty in North Dakota is $20 to $50, or imprisonment not exceeding thirty days; in Wyoming, $25 to $100, or ten to ninety days' imprisonment; in Minnesota, $50 to $100, or thirty to ninety days' imprisonment, or both; in South Dakota, $25 to $200, and not more than thirty days' imprisonment, with forfeiture of both gun and game. In all these States except Wyoming the general nonresident license costs $25. If, as in some of the cases just mentioned, the minimum penalty is about the same or less than the license fee it encourages violation of the law. Unprincipled hunters will risk detection and a fine that does not exceed the license rate on the chance of escaping any payment. This difficulty may be overcome by making the minimum fine sufficiently large; thus $10 in the case of residents and at least twice the license fee in that of nonresidents should have a sufficiently deterrent effect. Confiscation of gun, boat, or other paraphernalia may cause vigorous resistance to the law on constitutional grounds, in which the contestant may be sustained by the courts. The plan of holding the hunting outfit as security for payment of the fine, however, as provided in some laws, is of a different character, and may be employed with much better results.

The question naturally suggests itself as to how far license laws, and especially those relating to nonresidents, are enforced. Unfortunately statistics on the point are too meager to furnish reliable conclusions; still such as are obtainable are interesting, as indicating that the laws are certainly not violated with impunity. Thus for hunting without a license there were 9 convictions in Montana in 1902; in New Jersey 9 convictions in 1902 and 45 arrests in 1903; in Pennsylvania 23 arrests in 1902, and in West Virginia 5 convictions in 1901 and 8 in 1903. Recently a sportsman from Homestead, Pa., who had been indicted for hunting squirrels out of season in West Virginia, was arrested and taken, under extradition papers, to Morgantown, W. Va., where he was fined $25 and costs for hunting without a nonresident license. He was also required to deposit $110 as a guarantee of his appearance at the next term of court to answer the indictment.[a] In Canada hunting without a license frequently results in arrest. In Ontario 26 arrests were made and 21 convictions secured in 1901, and 9 convictions in 1902; 5 guns, 1 rifle, and 1 boat in the possession of unlicensed hunters were also seized in 1901.

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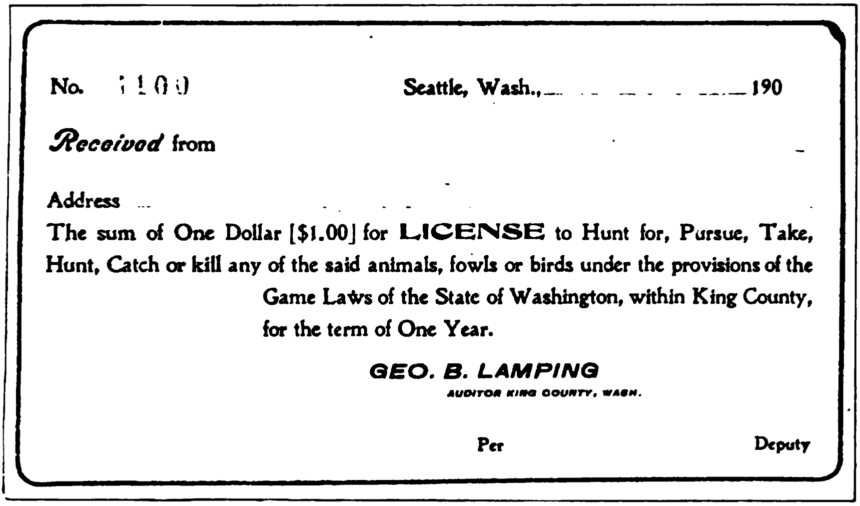
[a] Letter dated September 17, 1904, from Deputy Warden Bennett S. White, who conducted the case.



No. 1100

Seattle, Wash.,_____________190

Received from

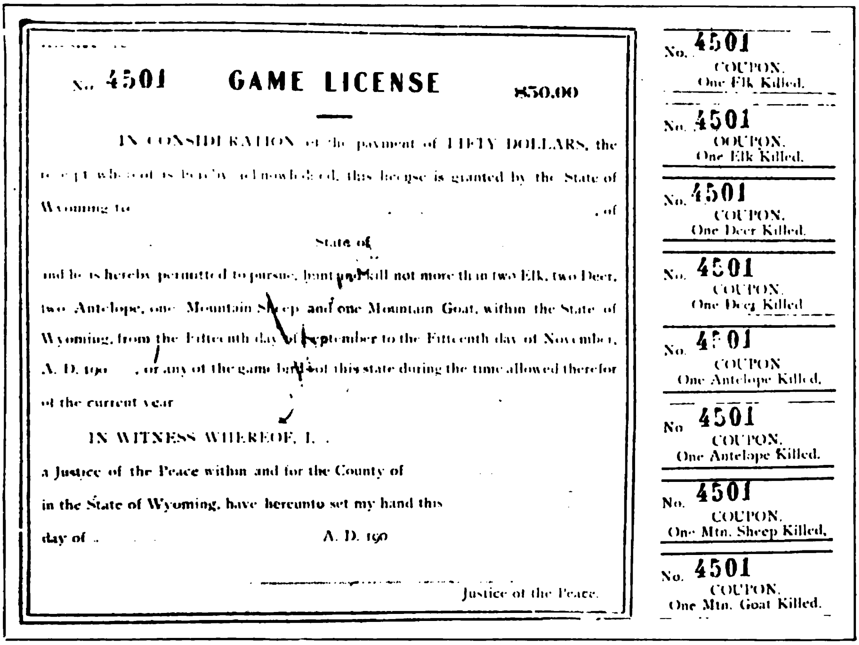
Address

The sum of One Dollar [$1.00] for **LICENSE** to Hunt for, Pursue, Take, Hunt, Catch or kill any of the said animals, fowls or birds under the provisions of the Game Laws of the State of Washington, within King County, for the term of One Year.

GEO. B. LAMPING

AUDITOR KING COUNTY, WASH.

Per Deputy



No. 4501 **GAME LICENSE** $50.00

IN CONSIDERATION of the payment of FIFTY DOLLARS, the receipt whereof is hereby acknowledged, this license is granted by the State of Wyoming to , of State of and he is hereby permitted to pursue, hunt and kill not more than two Elk, two Deer, two Antelope, one Mountain Sheep and one Mountain Goat, within the State of Wyoming, from the Fifteenth day of September to the Fifteenth day of November, A. D. 190 , or any of the game birds of this state during the time allowed therefor of the current year

IN WITNESS WHEREOF, I, a Justice of the Peace within and for the County of in the State of Wyoming, have hereunto set my hand this day of A. D. 190

Justice of the Peace.

No. 4501
COUPON.
One Elk Killed.

No. 4501
COUPON.
One Elk Killed.

No. 4501
COUPON.
One Deer Killed.

No. 4501
COUPON.
One Deer Killed.

No. 4501
COUPON
One Antelope Killed.

No 4501
COUPON.
One Antelope Killed.

No. 4501
COUPON.
One Mtn. Sheep Killed.

No. 4501
COUPON.
One Mtn. Goat Killed.

EXTREMES OF NONRESIDENT LICENSES, 1903—THE $1 LICENSE OF WASHINGTON AND THE $50 LICENSE OF WYOMING.

The Washington license is 3¾ by 6¾ inches, printed on white paper, with an extract from the law on the back; the Wyoming license is 6 by 8 inches and printed on white paper.

PRESENT STATUS OF LICENSE LEGISLATION.

From a small beginning in a few States nonresident licenses have steadily increased in number during the past ten years, until at the present time they are required in 31 States and Territories,[a] and in practically all the Provinces of Canada. Since 1895 the adoption of resident licenses has spread to 13 States and 3 Canadian Provinces.

As a rule, nonresident licenses are required for hunting any game, but in Michigan, New Hampshire, New Brunswick (except Westmoreland County), and Newfoundland they are necessary only for big game. Great variety exists in the form of the license, in detail of issue, and in the accompanying privileges, but there is a tendency toward the adoption of more uniform fees and of the so-called coupon license, which provides the holder not only with a permit to hunt but also tags to insure the safe shipment of his game. The fees range from $1 to $50 (see Pl. VII), but in most cases the rate is $10 for birds and $25 for big game and birds. In a few States the maximum rate has recently been reduced to $15. The majority of States now permit the licensee to carry with him out of the State a reasonable amount of game obtained under his license.

Resident licenses are required in most of the States along the northern border from Michigan westward. Ordinarily the fee is $1, but in a few States it is only 75 cents, and in Hawaii $5. These licenses were first required only for hunting big game, but in most States their use has now been extended to cover hunting all game.

In some cases the receipts, particularly from resident licenses, have furnished a much larger income for game protection than was anticipated, and several States now depend largely on this source of revenue for maintenance of their warden service. With adequate license laws properly enforced, the work of game protection may be made practically self-supporting.

Naturally some opposition has been manifested to the adoption of the license system. Questions have been raised as to the constitutionality of the laws affecting nonresidents and some of these questions are still unsettled.

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[a] In addition to these States, Georgia and Oregon require nonresidents engaging in market hunting to secure licenses. Market-hunting licenses are issued to residents, only in Georgia, Louisiana, and Tennessee.

DECISIONS OF THE COURTS ON NONRESIDENT LICENSE LAWS.[a]

Several cases have been decided in State courts involving directly or indirectly the validity of nonresident hunting licenses, but the question has not yet been directly decided by the Supreme Court of the United States. As there is no immediate prospect of such a decision[b] it may be interesting at least to review briefly the precedents which have already been established and to refer to one or two decisions of the Supreme Court in analagous cases, which indicate to some extent what the attitude of that court would be if the question were directly before it. But first it should be explained that the chief grounds of attack on the constitutionality of nonresident licenses are the clauses in the Federal Constitution prohibiting taxes or duties on articles exported from any State (Art. I, sec. 9), guaranteeing to citizens of each State all the privileges and immunities of citizens of the several States (Art. IV, sec. 2), and prohibiting legislation "which shall abridge the privileges or immunities of citizens of the United States, * * * or deny to any person within its jurisdiction the equal protection of the laws." (Amend. XIV.)

While nonresident license laws have been declared void in a few cases, they have been so declared by inferior courts or on technical grounds and not by the highest courts or on the merits of the question. In 1886 the circuit court of Craighead County, Ark., declared the Arkansas act of 1875 unconstitutional (Am. Field, XXVII, p. 49, Jan. 15, 1887). In April, 1887, the circuit court of Poinsett County, Ark., held the same act unconstitutional, and as a consequence judgment was rendered against the sheriff of the county for $10 and costs in each of 18 cases in which he had collected $10 license fees from nonresidents. (Am. Field, XXVIII, pp. 3-4, July 2, 1887.) In 1901 the superior court of Spokane County, Wash., declared the Washington law unconstitutional because it discriminated in not requiring boys under 16 years of age to be licensed, and in 1903 declared a subsequent nonresident license law void on account of a defect in the title. (Field and Stream, VIII, p. 501, Oct., 1903.) None of these cases was appealed to the supreme court, and the decisions, therefore, even had they directly considered the license principle, could not be considered as furnishing authoritative precedents. In 1903 the circuit court of Crittenden County, Ark., declared the Arkansas law prohibiting nonresidents from hunting in the State unconstitutional in so far as it prohibited nonresidents from hunting on their own land. (Am. Field, LX, p. 52, July 18, 1903.) This case has been appealed to the supreme court of Arkansas, but the decision has not yet been rendered. In May, 1904, a case (Cummings *v.* People) which may result in a decision on the nonresident license question, was carried to the supreme court of Illinois on writ of error. One of the contentions in this case, which involves the constitutionality of the Illinois game law of 1903, is that the statute is invalid because it discriminates between resident and nonresident hunters.

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[a] See also article on 'Nonresident Licenses,' by William A. Talcott, jr., in Forest and Stream, L, pp. 205-206, March 12, 1898.

[b] In December, 1902, the 'American Field' started a fund for the purpose of defraying the costs of carrying a test case to the Supreme Court, but during the first eight months collected only about $160. (Am. Field, LVIII, pp. 593, 597, 1902; LX, p. 145, 1903.)

On the other hand two decisions have been rendered by higher courts which uphold the constitutionality of such laws, one by the supreme court of New Jersey in 1886 and the other by the United States circuit court of the northern district of Illinois in 1899. In the former case (Allen *v.* Wyckoff, 48 N. J. Law Rep. 90; 2 Atl. 659) one Allen was arrested and fined $50 for violating the act for the protection of game and game fish approved April 4, 1878, which imposed greater restrictions and severer penalties upon nonresidents of the State than upon residents. The case was appealed to the supreme court of New Jersey, which held that the act in question was not in violation of the fourteenth amendment of the Constitution of the United States, prohibiting any State from making any law which shall abridge the privileges of citizens of the United States or deny to any person the equal protection of the laws; and furthermore that the statute was valid in its application to a nonresident killing game on the property of persons who have formed an association under the laws of the State for the protection of game on their own property.

In passing upon the question of constitutionality, after showing that section 2 of Article IV of the Constitution, and so much of the fourteenth amendment as secures the privileges and immunities of a citizen of the nation were not applicable to the case in hand, as Allen was not a citizen of the United States, the court said:

> The only clause of the federal constitution, therefore, which, on the surface seems to have any pertinency is that forbidding a state to deny to any person within its jurisdiction the equal protection of the laws. But even this appearance is dissipated, I think, when we examine the decision of the supreme court of the United States in the Slaughter-house Cases, 16 Wall. 36. It was there argued that a state law which authorized a corporation to establish stock-yards and slaughter-houses in and near New Orleans, and prohibited all other persons from slaughtering cattle or keeping stock-yards elsewhere, within an area of about 1,154 square miles around the city, was an infringement of this fourteenth amendment; that the right to use one's land, skill, and labor in any lawful business for the acquisition of property

was a fundamental civil right, which, according to any just theory of government, was entitled to the protection of the law; that, therefore, while the right might of course be regulated by state legislation, this amendment required that the laws for such purpose should operate equally upon all persons within the jurisdiction; and that the statute, securing such a right to some persons, and denying it to others in substantially similar situation, was invalid. But the court decided that laws of this nature were not within the purview of this clause of the amendment; that it had been framed to remedy the evils arising from the existence of laws in the states where the newly-emancipated negroes resided, which discriminated with gross injustice and hardship against them as a class; and that this design must be kept in view in determining the scope and effect of the provision; the learned justice who spoke for the court saying: 'We doubt very much whether any action of a state not directed by way of discrimination against the negroes as a class, or on account of their race, will even be held to come within the purview of this provision. It is so clearly a provision for that race and that emergency, that a strong case would be necessary for its application to any other.' * * *

Bearing in mind, then, this indication of the scope of the amendment, afforded by the ultimate arbiter of its construction, how can it be said that the statute now under review is interdicted by it? * * * The statute seems to stand in the same category as the Louisiana act, as an exercise of the police power for the regulation of one of the modes of acquiring property; and, as such, it might be embraced within the terms of the amendment, by giving them their widest signification, but, restricted as the supreme court declares their meaning to be, they do not touch the matter in hand. No rights of the prosecutor under the federal constitution therefore seem to be infringed.

In the Illinois case, *In re* Eberle (98 Fed. 295), the validity of the nonresident license was directly decided. Frank Eberle, a citizen of Iowa and a member of the Crystal Lake Club, an Illinois corporation authorized to acquire and own real estate in Illinois for use as a game and fish preserve, was arrested when hunting on the lands of the club. He was charged with hunting without a license in violation of the State law requiring a license of $10 from nonresidents, passed in 1899 subsequent to the incorporation of the club. At the trial the defendant was adjudged guilty of violation of the statute and was sentenced to pay a fine of $25 and costs and stand committed until the fine was paid. An unsuccessful application was made to the United States circuit court for a writ of habeas corpus.

In denying the writ the court held:

The sovereign ownership of wild game is in the state, in trust for the benefit of its citizens; and a statute requiring the payment of a license by a nonresident for the privilege of hunting such game within the state is a police regulation within the power of the state, and not in violation of article 4, sec. 2, of the federal constitution, or of section 1 of the fourteenth amendment, although such fee is not required of residents of the state; nor is the validity of such regulations as to a particular individual, who is a nonresident of the state, affected by the fact that he is a stockholder in a corporation of the state which owns lands maintained as a game preserve.

Several important decisions are on record sustaining statutes prohibiting nonresidents from taking oysters. As early as 1823 the United States circuit court upheld the New Jersey oyster law of 1820

(Corfield *v.* Coryell, 4 Wash. C. C. 371). This is a leading case on the subject. In 1855 the supreme court of Rhode Island sustained a similar statute of that State passed in 1844, which prohibited nonresidents from taking oysters within the waters of Rhode Island. In 1873 the supreme court of New Jersey upheld the New Jersey act of 1846 (Haney *v.* Compton, 36 N. J. L. 507), and in 1901 again upheld a similar statute passed in 1899 (State *v.* Corson, 50 Atl. 780). In rendering the decision in the Haney case the court said:

> A full ownership of this species of property empowers the State to declare who shall take it, upon what terms it shall be taken, and by what means it shall be removed. A citizen of Pennsylvania cannot claim a right to acquire the property of New Jersey in a manner different from that to which New Jersey agrees to dispose of it.

The Supreme Court of the United States has upheld the public ownership of game and has quoted with approval the decision of the supreme court of California (*Ex parte* Maier) to the effect that—

> The wild game within a State belongs to the people in their collective sovereign capacity. It is not the subject of private ownership except in so far as the people may elect to make it so; and they may, if they see fit, absolutely prohibit the taking of it, or traffic and commerce in it, if it is deemed necessary for the protection or preservation of the public good. (Geer *v.* Connecticut, 161 U. S. 529.)

The same court has, moreover, decided, in the case of McCready *v.* Virginia (94 U. S. 248), that a State may pass laws discriminating against nonresidents, by upholding, in 1877, a statute of Virginia (act of 1846) which absolutely prohibited nonresidents from planting oysters in the waters within the limits of the State. In rendering the opinion of the court Chief Justice Waite said:

> The precise question to be determined in this case is, whether the State of Virginia can prohibit the citizens of other States from planting oysters in Ware River, a stream in that State where the tide ebbs and flows, when its own citizens have that privilege.
>
> The principle has long been settled in this court, that each State owns the beds of all tide waters within its jurisdiction, unless they have been granted away. * * *
>
> By article IV., sec. 2, of the Constitution, the citizens of each State are 'entitled to all privileges and immunities of citizens in the several States.' * * * we think we may safely hold that the citizens of one State are not invested by this clause of the Constitution with any interest in the common property of the citizens of another State. If Virginia had by law provided for the sale of its once vast public domain, and a division of the proceeds among its own people, no one, we venture to say, would contend that the citizens of other States had a constitutional right to the enjoyment of this privilege of Virginia citizenship. Neither if, instead of selling, the State had appropriated the same property to be used as a common by its people for the purposes of agriculture, could the citizens of other States avail themselves of such a privilege. And the reason is obvious; the right thus granted is not a privilege or immunity of general but of special citizenship. It does not 'belong of right to the citizens of all free governments,' but only to the citizens of Virginia, on account of the peculiar circumstances in which they are placed. They, and they alone, owned the property to be sold or used, and they alone had the power to dispose of it as they saw fit. They owned it not by virtue of citizenship merely, but of

citizenship and domicil united; that is to say, by virtue of a citizenship confined to that particular locality.

The planting of oysters in the soil covered by water owned in common by the People of the State is not different in principle from that of planting corn upon dry land held in the same way. Both are for the purposes of cultivation and profit; and if the State, in the regulation of its public domain, can grant to its own citizens the exclusive use of dry lands, we see no reason why it may not do the same thing in respect to such as are covered by water. And as all concede that a State may grant to one of its citizens the exclusive use of a part of the common property, the conclusion would seem to follow, that it might by appropriate legislation *confine the use of the whole to its own People alone.*

HUNTING LICENSES IN FOREIGN COUNTRIES.

For purposes of comparison with the license system of the United States and Canada, particularly in the matter of fees, reference may be made briefly to the conditions surrounding hunting in a few foreign countries. In general it may perhaps be said that hunting licenses are required in a majority of civilized countries, except those under the control of Spanish-speaking nations. In Europe licenses to hunt or to carry firearms are generally required, and in some countries, as for example, Prussia, distinctions are made between residents and nonresidents. Without going into the subject in detail it will suffice to mention by way of illustration the license systems of Great Britain and Germany for Europe, Japan for Asia, New Zealand for Australasia, and the colonies of German East and Southwest Africa, Sudan, and Transvaal for Africa. It will be observed that the issue of hunting licenses is not restricted to the older countries of Europe where game is scarce, but has been extended to colonies in the heart of Africa which have only recently come under European control and where large game is more abundant than anywhere else in the world.

GREAT BRITAIN.

For shooting in Great Britain three or even four licenses must be taken into consideration. Separate licenses are required for killing game, for carrying a gun, and for the use of a dog, and in addition, a gamekeeper's license may be necessary. Game and gun licenses are the only ones requiring consideration in this connection. Both are excise licenses, and enforcement of the regulations regarding them is in the hands of the commissioners of inland revenue. Under the act of 1860, "licenses to kill game"[a] are issued throughout Great Britain and Ireland for one year, ending July 31, at a cost of £3 ($15), or for a period of six months, at £2 ($10), or for fourteen days, at £1 ($5). These licenses may be obtained at most post-offices. They are not required for netting or trapping woodcock and snipe, for capturing rabbits and hares, or for hounding or hunting deer on inclosed lands with the owner's permission. Members of the Royal family and the King's gamekeepers are exempt from the provisions of the law, and a further exemption is made of unarmed assistants of licensees.

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[a] This is the designation in England and Scotland. In Ireland the earlier term of 'certificates' is still retained.

Under the act of 1870, every person who uses or carries a gun is required to secure a license unless he has a license to kill game. Gun licenses may be obtained at money-order offices, and, like game licenses, are good throughout the United Kingdom. These licenses are issued for one year, expiring July 31, at a cost of 10 shillings ($2.50). A gun license is not required in case of members of the naval, military, or volunteer service, of any person carrying a gun belonging to the holder of a gun or game license, or where guns are used to kill vermin or frighten birds by occupants of lands, or are carried by gunsmiths or common carriers in connection with their regular business.

GERMANY.

Under the law of July 31, 1895, several forms of licenses (Jagdscheine) are issued for hunting in Prussia. A resident may obtain an annual license on payment of 15 marks ($3.75), or one good for three days for 3 marks (75 cents). A foreigner or nonresident—that is, a person who has no domicile or owns no property in Prussia—must pay 40 marks ($10) for an annual license and 6 marks ($1.50) for a three-day license. Officers in the forest service are furnished free licenses good for a year. In either case the holder must own land on which he can hunt or must have an invitation from some one who owns a preserve. Each license has its own distinctive color—yellow for the annual, red for the daily, white for the gratuitous, and the same colors, but with a black background, for the nonresident. Each has a diagram printed on the back, showing the open and close seasons for each kind of game, and is good throughout Prussia, except in the island of Heligoland.

NEW ZEALAND.

Under the animals protection act of 1880 hunting game is prohibited except under license. These licenses are good only during the open season and within the district for which issued. The license fees, not to exceed 50 shillings ($12.50), are fixed by notification of the governor.

JAPAN.

Under the general game law of Japan two series of licenses are issued: (A) For capture of live game with net or lime, and (B) for killing game with a gun. Each of these licenses is issued in three classes, distinguished by different colors, and these classes are based upon the amount of taxes paid by the holder. First-class licenses (buff) are issued to persons paying not less than 100 yen ($50) income tax, 500 yen ($250) land tax, or 150 yen ($75) business tax. To such persons or the members of their families the fee is 20 yen ($10). Second-class licenses (green) are issued to persons paying not less than 3 yen ($1.50) income tax, 30 yen ($15) land tax, or 20 yen ($10) business tax, and the fee for such persons or the members of their families is 10 yen ($5). Third-class licenses (red) are issued to persons who are not included in the first and second classes. All these licenses are printed on pieces of thin cardboard somewhat larger than ordinary postal cards. On the face of the license are shown the number and class and the season for which issued; the status, domicile, occupation, name, and age of the holder; and the seal of the department of agriculture and commerce. On the back is printed an abstract of the game law, showing the close seasons, the birds protected at all times, and the conditions under which hunting is permitted.

GERMAN EAST AFRICA.

Under the ordinance of July, 1903, hunting licenses are required in the German East African hunting district. The fee is 10 rupees[a] ($3.25), but applicants who have no permanent residence in the district are required to make a deposit of 500 rupees before the license is issued. In addition, special fees are required for hunting the following kinds of game: 1 rupee for each dwarf antelope; 3 rupees for each gnu, hartebeest, waterbok, rappenantilope, certain other kinds of antelope, kudu, oryx, ape (*Colobus*), or marabu; 10 rupees for each leopard; 20 rupees for each buffalo, hippopotamus, or lion; 30 rupees for each rhinoceros, and 100 rupees for each elephant.

These licenses are good only during the calendar year in which issued, are not transferable, and may be refused to applicants who, during the five years preceding their application, have been guilty of violating the game or certain other laws of the district.

GERMAN SOUTHWEST AFRICA.

Under the ordinance of 1902 licenses are issued under certain conditions for hunting in German Southwest Africa. As in similar cases elsewhere, these licenses are issued for one year, are valid throughout the hunting district, are not transferable, and are to be obtained in the district of which the person is a resident. The fee is 30 marks ($7.50). If the applicant is not a resident of the district, permits may be obtained from the government. When hunting is carried on in connection with a regular expedition a special license must be obtained, the fee for which is 1,000 marks ($250) per year unless suspended by special order of the government.

SUDAN.

In the Sudan two forms of licenses are issued for hunting. License A costs £25 ($125), and entitles the holder to capture or kill a limited number of any of the common and some of the rarer species of big game, including several kinds of antelope and some of the larger birds. Special fees, varying from 250 milliemes ($1.25) to 50 pounds Egyptian ($256)—in the case of rhinoceroses—are required for killing certain animals, and extra taxes are collected for the shipment of trophies of various species. License B costs but £5 ($25), and allows the holder to kill 10 specimens each of wild sheep, ibex, wart hog, certain species of antelope, and large bustards.

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[a] The rupee is equivalent to about 32½ cents.

TRANSVAAL.

In the Transvaal, under the game ordinance of 1902, a license is required to hunt in any part of the colony, except by owners or lessees of land hunting on their own property. The fee for this license is £3 ($15) for the whole season, or £1 ($5) for a period not exceeding two weeks. Certain game, such as elephants, hippopotamuses, buffaloes, several of the rarer antelopes, giraffes, rhinoceroses, quaggas, zebras, ostriches, and cranes can not be hunted without a special permit from the Colonial Secretary, and such permit must bear a £25 ($125) stamp.

INDEX OF LICENSE LEGISLATION IN THE UNITED STATES AND CANADA, 1872-1904.

The following index is arranged chronologically to show the progress of license legislation in the United States and Canada. An attempt is here made to bring together in a brief summary all the important acts, including those prohibiting nonresidents from hunting, which have been passed in the various States and Provinces since 1872, apparently the date of the first hunting-license law in the United States. Various restrictions were imposed on nonresidents much earlier than this, but no attempt has been made to collect these laws systematically. The more important ones, with their references, are noted on pages 10–12.

The number of statutes mentioned in the following list is about 160, of which over 50 are local laws of Maryland. Each entry is accompanied by a brief statement of the important provisions of the law and a reference to the volume and chapter or page, so that the original statute may be readily consulted, if necessary.

[An asterisk * indicates the first law of the kind in the State or county.]

1872. **Maryland.**—$20 licenses* required for sink boxes and $5 licenses* for sneak boats used in hunting wild fowl on the Susquehanna flats in Cecil and Harford counties. Licenses issued only to residents. (Laws of 1872, chap. 54.)

1873. **New Jersey.**—Nonresident license* required to hunt in Atlantic, Camden, Cape May, Cumberland, Gloucester, or Salem counties. Fees, $5 first year and $2 in subsequent years. (Acts of 1873, chap. 470.) Repealed March 23, 1896.

1875. **Arkansas.**—$10 market hunting license* required of nonresident trappers, hunters, seiners, or netters of fish. (Acts of 1875, p. —.) Fee increased in 1897. Privilege of hunting entirely withdrawn from nonresidents in 1903.

Florida.—$25 nonresident county license* required for hunting game to carry out of the State. A party of six persons hunting together included under one license on payment of an additional $5 each. (Acts of 1875, chap. 2055.)

1876. **Maryland.**—

Anne Arundel.—$30 licenses* issued to residents only to use sink boxes in hunting waterfowl on the waters of the county. (Laws of 1876, chap. 78.)

Anne Arundel and Prince George.—Nonresidents prohibited* from hunting in Anne Arundel and Prince George counties without permission from landowners. Penalty, $5 fine and forfeiture of gun. (Ibid., chap. 309.)

1877. **Missouri.**—Nonresidents prohibited* from hunting game for sale or export. (Laws of 1877, p. 333.)

Tennessee.—Nonresidents of Obion and Lake counties prohibited* from killing wild fowl for market on Reelfoot Lake. (Laws of 1877, chap. 145, sec. 1.)

1878. Maryland.—

Cecil.—$10 license* required of residents of Cecil County for use of sink boxes on Elk and Bohemia rivers. (Laws of 1878, chap. 292.)

Fee for sink-box license on Susquehanna Flats in Cecil County, reduced from $20 to $10. (Ibid., chap. 292.)

New Jersey.—Nonresidents prohibited* from hunting any game except waterfowl without complying with the by-laws of the game protective societies organized or to be organized under the laws of the State. (Laws of 1878, chap. 184, sec. 1.)

New Brunswick.—$20 nonresident license* required for hunting any animals or birds in the Province. Licenses good until September 1 following date of issue. Fee for officers of army or navy, $5. (Laws of 1878, chap. 45, secs. 26–29.)

1879. Delaware.—Nonresidents required to secure certificates of membership* in the Delaware Game Protective Association before hunting in the State. Fees, $5 the first year, $2 in subsequent years. (Laws of 1879, chap. 111, sec. 6.)

Missouri.—Nonresidents prohibited from hunting within the State. (Rev. Stat. 1879, I, sec. 1618.)

Tennessee.—Hunting game for profit prohibited* in Cumberland, Fentress, Morgan, Scott, Campbell, Overton, Putnam, White, Roane, Carroll, Rhea, Bledsoe, and Van Buren counties. (Laws of 1879, chap. 133, sec. 1.)

Virginia—Nonresidents of the State prohibited* from hunting or trapping partridges in Accomac or Northampton counties without written consent of owners or occupants of the lands. (Acts of 1879, chap. —.)

1880. Maryland.—

Cecil and Kent.—$10 license* required of residents of Cecil and Kent counties for the use of sink boxes on Sassafras River. (Laws of 1880, chap. 42.)

Patuxent River.—Nonresidents of Anne Arundel, Calvert, Charles, Prince George, and St. Mary counties prohibited* from shooting snipe, ortolan, and wild fowl on the Patuxent River. (Ibid., chap. 176.)

Queen Anne.—$10 license* required of residents of Queen Anne County for use of sink boxes on waters of county. Licensee prohibited from allowing use of sink box to nonresident under penalty of $20–$100, and (in case of nonresident) confiscation of sink box and other paraphernalia. In case of resistance the penalty is $50–$100. (Ibid., chap. 370.)

1882. Maryland.—

Anne Arundel.—Licenses* at $2 each (and clerk's fee of 50 cents) required for the use of 'booby' or 'bush' blinds on the Severn, South, and Magothy rivers. (Laws of 1882, chap. 400.)

Caroline.—$4.50 nonresident license* required for hunting rabbits, muskrats, quail or partridges, woodcock, sora or water rail, and ducks in Caroline County.

Quebec.—$20 nonresident licenses* required for hunting in the Province. (45 Vic., chap. 15, secs. 17–18.)

1883. North Carolina.—Nonresidents of the State prohibited from shooting wild fowl in Currituck and Dare counties from blind, box, battery, or float on the water.

1884. New York.—$10 nonresident license* required for hunting on Staten Island (Richmond County). (Laws of 1884, chap. 185.) Repealed in 1892.

South Carolina.—$25 market-hunting license* required for each nonresident hand employed by nonresidents hunting ducks, fishing, gathering oysters or terrapins, or selling game in Beaufort, Berkeley, Charleston, Colleton, and Georgetown counties. (Laws of 1884, p. 734.)

1884. **Nova Scotia.**—$30 nonresident license* required for killing moose and other game, and $10 nonresident license* for killing birds. All licenses expire August 1. Fee for officers in Her Majesty's service $5, but members of Game and Inland Fishery Protection Society exempt. (Rev. Stats., 5th ser., chap. 76, sec. 26.)

Quebec.—$20 nonresident license required for hunt in the province, but in exceptional cases lieutenant-governor in council may grant hunting permits at a less rate or gratuitously. License not required of Ontario hunters. (47 Vic., chap. 25, sec. 20.)

1885. **South Carolina.**—Market-hunting license provisions of 1884 modified to add to the $25 license for each nonresident hand a $25 nonresident license for pursuing the business.

1886. **Maryland.**—

Anne Arundel and Prince George.—$6 nonresident license* for hunting rabbits, partridges, and woodcock. Guest hunting on land of host exempt. (Laws of 1886, chap. 190.)

Baltimore.—$10 nonresident license* for hunting rabbits or woodcock. (Ibid., chap. 538.)

Caroline.—$19.50 license required of nonresidents for hunting rabbits, muskrats, quail or partridges, woodcock, sora or water rail, or ducks. (Ibid., chap. 505.)

Kent.—$4.50 nonresident license* for hunting any game. Guest hunting on land of host exempt. (Ibid., chap. 135.)

Queen Anne.—$4.50 nonresident license* for hunting any game. Guest hunting on land of host exempt. (Ibid., chap. 88.)

Talbot.—$9.50 nonresident license* for hunting any game protected by the county. (Ibid., chap. 442.)

Virginia.—Nonresidents prohibited* from killing wild fowl from skiff, float, or sink box in Fairfax, Henrico, King George, Prince William, or Stafford counties. Guns, boats, or sink boxes to be forfeited. Law not applicable to nonresidents renting shores on broad waters of Back Bay. (Acts of 1886, chap. 383.)

Wyoming.—Nonresidents prohibited* from hunting game animals in the State. (Laws of 1886, chap. 109.) Repealed in 1895.

1887. **Quebec.**—$5 resident licenses* issued for killing 5 caribou and 5 deer more than legal number. Commissioner of Crown lands may exempt from payment of the fee any Indian whose poverty has been established to his satisfaction. Nonresident license fee of members of hunting and fishing clubs incorporated in the Province reduced to $10. Limit on big game which may be killed under license. (50 Vic., chap. 16, secs. 3 and 12.)

1888. **Maryland.**—

Caroline.—$4.50 fee restored for nonresident license, and owners of real estate in county exempted from requirements of license law.

Charles.—$20 nonresident license* required for hunting rabbits, partridges, or woodcock. Penalty, $20, or ten days and forfeiture of gun, ammunition, and other apparatus. (Not needed by one hunting by written permission of landowner.) $25 nonresident license for hunting wild fowl on waters of county. (Laws of 1888, chap. 352.)

Dorchester.—$5 nonresident license* required for hunting rabbits, partridges, or woodcock. (Not needed by owners of land in county, or their relatives, nor by relatives or connections by marriage of residents.) (Ibid., chap. 29.)

Howard.—$7.50 nonresident license* for hunting any game. (Not needed by one hunting under written permission of landowner.) (Ibid., chap. 90.)

1888. **South Carolina.**—Nonresident market-hunting license fees increased to $500, and $100 additional for each nonresident hand employed.

Ontario.—Nonresidents prohibited from killing deer prior to 1895 unless they have secured a $10 license* from the commissioner of Crown lands. Law not applicable to shareholders in an incorporated company hunting on lands of said company. (51 Vic., chap. 36, sec. 16.)

1889. **Tennessee.**—Nonresidents of the State prohibited* from hunting game for profit in certain counties and from hunting at all in others. (Laws of 1889, chap. 179, sec. 1; chap. 244, sec. 2.)

Nonresidents of certain counties prohibited from killing game for market in these counties. (Ibid., chap. 244, sec. 2.)

Nonresidents of the State prohibited from killing wild fowl on Reelfoot Lake. (Ibid., chap. 156, sec. 1.)

Newfoundland.—$100 nonresident license* required for killing caribou. Officers of British war ships stationed on the coast for fisheries protection exempt from license. (Deer preservation act 1889, sec. 6; Con. Stat. 1892, chap. 143, sec. 6.)

1890. **Maryland.**—

Dorchester.—Nonresidents of Parson Creek, Church Creek, and Neck districts prohibited* from hunting wild fowl in the Little Choptank River. Penalty: $20 and costs, and forfeiture of boat, guns, and other "fixtures." (Laws of 1890, chap. 140.)

Somerset.—$9.50 nonresident license* for hunting any game. (Not needed by one invited and accompanied by a resident.) (Ibid., chap. 589.)

Worcester.—$10 nonresident license* for hunting wild fowl. (Ibid., chap. 446.)

British Columbia.—$50 nonresident license* required for killing big game. Limit: 10 deer, 2 bull elk, 3 reindeer, 5 caribou, 8 mountain sheep, 8 mountain goats. Members of army, navy, and Canadian militia in service in the Province require no licenses. (Game-protection act 1890, secs. 9–10.)

Manitoba.—$25 nonresident license,* good for calendar year, required for hunting animals or birds in the Province. (Game act of 1890, sec. 8.)

1892. **Maryland.**—

Anne Arundel and Prince George.—Law of 1880 (chap. 176) amended so as to restrict hunting of snipe, ortolan, and wild fowl on the Patuxent River in Anne Arundel and Prince George counties to residents of these counties, except such as have permission of a majority of the citizens adjacent to the river and employ a licensed boat. $2 pusher's license* required for pushing, paddling, or conveying nonresidents hunting on Patuxent River. Penalty: $10–$30, or, in default, confiscation of boat and fixtures. (Laws of 1892, chap. 360.)

St. Mary.—$20 nonresident license* required for hunting rabbits, partridges, and woodcock. Penalty: $20 or ten days, and forfeiture of guns and other paraphernalia. (Ibid., chap. 588.)

South Carolina.—$25 nonresident license* required for hunting in Beaufort County; Horry County added to those in which market hunting is licensed.

Virginia.—Nonresidents of the State prohibited* from killing wild fowl on the marshes, islands, or beaches below the head of tide water, except in Accomac and Northampton counties. (Laws of 1891–2, p. 1070.)

Ontario.—$25 nonresident license* required for hunting big game or birds. (Acts of 1892, chap. 58, sec. 8.)

1893. **South Carolina.**—$25 nonresident county license* required for killing game of any kind. Not required of persons hunting on their own land. (Act of December 22, 1893, sec. 3.) [Repealed by omission from Code of 1902.]

1893. **Northwest Territories.**—$5 nonresident license,* good until May 15 following date of issue, required for hunting big game or birds. Free licenses * may be granted to guests of residents for five days or less. (Game ordinance of 1893,[a] sec. 11.)

1894. **Maryland.**—

Anne Arundel and Prince George.—Laws of 1880 (chap. 176) and 1892 (chap. 360) amended by extending privilege of hunting snipe, ortolan, and wild fowl on Patuxent River to citizens of Calvert County. (Laws of 1894, chap. 586.)

Anne Arundel.—Nonresidents prohibited* from hunting in the county. Penalty: $10–$50, or, in default, one to three months, and forfeiture of gun and other apparatus. (Ibid., chap. 103.)

Baltimore.—$10 nonresident license required for hunting gray squirrels, rabbits, partridges, pheasants, and woodcock. Penalty: $10 for each bird or animal killed or in possession, forfeiture of gun to owner of property on which game is killed, and ten days in default of fine. Taxpayers and those hunting except for market under express authority on land of resident are exempt. Nonresidents prohibited from hunting or obtaining license until 1895. (Ibid., chap. 122.)

Carroll.—$10 nonresident license* required for hunting squirrels, rabbits, partridges, pheasants, and woodcock. Penalty: $10 for each animal or bird killed or found in possession, forfeiture of gun to owner of property on which game is killed, and ten days in default of fine. Taxpayers and those hunting under express authority on land of resident are exempt. (Ibid., chap. 224.)

Cecil.—Chapter 292, laws of 1878, repealed, and use of sinkboat, sneak boat, or boat of any kind on Elk and Bohemia rivers prohibited.* (Laws of 1894, chap. 556.)

Charles.—Nonresidents prohibited* from shooting wild fowl on waters of county. Penalty: $30 or thirty days, and forfeiture of guns, traps, boats, and all other devices used in violation of law. Repeal of nonresident license for shooting wild fowl; established in 1888. (Ibid., chap. 225.)

Harford.—$10 nonresident license* required for shooting rabbits, partridges, pheasants, woodcock, rail, reedbird, and robins. Taxpayers and persons hunting by invitation on land of resident are exempt. (Ibid., chap. 139.)

Kent.—$15 nonresident license required for shooting squirrels, rabbits, and birds. (Not needed by owner or tenant of land in county, and reduced to $5 in case of anyone hunting by invitation on land of resident.) (Ibid., chap. 501.

Prince George.—$20 nonresident license for shooting rabbits, partridges, and woodcock. (Ibid., chap. 542.)

Virginia.—Nonresidents of the State, except members of the Eastern Shore Game Protective Association, prohibited * from killing wild fowl in Accomac and Northampton counties. (Acts of 1894, chap. 740, sec. 2.) [The effect of this law was to make the membership fee in the association virtually a nonresident license fee.]

Nova Scotia.—Nonresident license provisions of 1884 practically reenacted. (Laws of 1894, chap. 2, secs. 29–31.)

1895. **Michigan.**—$25 nonresident* and 50 cent resident* licenses required for hunting deer. Licenses good only during open season, limited to 5 deer and required to have coupon attached authorizing shipment of 1 deer to any point in the State. Approved May 4, 1895. (Laws of 1895, chap. 238.)

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[a] The application of this ordinance was limited to Alberta, Assiniboia, and Saskatchewan by sec. 26 of the Unorganized Territories' Game Preservation acts of 1894 (57–58 Vic., chap. 31).

1895. **Minnesota.**—$25 nonresident license* required for hunting any game birds or animals, but law applicable only to citizens of States which have restrictive laws against nonresident hunters. Approved April 25, 1895. (Laws of 1895, chap. 207.) Repealed in 1903.

North Carolina.—$25 nonresident license* required for shooting from boxes, batteries, or floats on the waters of Dare County, south of the line from Manteo to Nagshead Life-Saving Station. (Laws of 1895, chap. 286.)

North Dakota.—$25 nonresident license* and 50 cent resident license* required for hunting any animals or birds in the State. Nonresidents cultivating not less than a quarter section of land may obtain resident license in county in which land is cultivated, and landowners hunting on their own property require no licenses.[a] (Rev. Codes, 1895, sec. 1645.)

Wyoming.—$20 nonresident county license* substituted in place of absolute prohibition in case of nonresidents hunting big game. Licenses permit killing males only during September, October, and November, and solely for food. Approved February 20, 1895. (Laws of 1895, chap. 98, sec. 14.)

British Columbia.—$50 nonresident license required for hunting big game. Members of army, navy, and Canadian militia require no license. (Game-protection act 1895, secs. 19–20.)

Quebec.—$5 resident license authorizing killing of 3 caribou and 3 deer (formerly 5) in excess of regular limits. Nonresident licenses divided into four classes: (1) For hunting all animals and birds except nongame birds, fee $30. (2) For hunting big game and fur-bearing animals, fee $25. (3) For hunting woodcock, snipe, plover, curlew, sandpipers, partridges, or water fowl, fee $20. (4) For hunting the same birds on the islands, bays, or shores of the Gulf of St. Lawrence,* fee $10. Fees reduced one-half in case of members of fish and game clubs incorporated in the Province. In exceptional cases lieutenant-governor in council, on recommendation of commissioner, may reduce fees or issue free permits. (59 Vic., chap. 20, secs. 1 and 8.)

1896. **Hawaii.**—$5 hunting license* required on the island of Oahu. (Laws of 1896, act 64.)

Newfoundland.—$100 nonresident license required for killing caribou. (Act August 6, 1896, sec. 5.)

Nova Scotia.—Modification in details of nonresident license law of 1884. $10 nonresident license required for hunting birds, hares, and rabbits, and $30 nonresident license for hunting other game. All licenses expire August 1. Fee for officers of army or navy stationed at Halifax, $5. Army or navy officers belonging to the Game and Inland Fishery Protection Society, persons who have had domicile in Nova Scotia, are in the service of the Province or of the government of Canada, and are members of the game society, and nonresidents paying not less than $20 real-estate tax, are exempt. (Laws of 1896, chap. 4, secs. 32–34; Rev. Stat., 1900, II, chap. 101, secs. 25–28.)

Ontario.—Residents required to obtain licenses* at $2 each to hunt deer in the Province. (59 Vic., chap. 68, sec. 2.)

1897. **Michigan.**—Nonresident license for deer, $25. Resident license increased to 75 cents. All licenses must bear coupons properly eyeletted; full details of issue. (Acts of 1897, p. 403.)

North Carolina.—Nonresidents of the State prohibited* from hunting birds or wild fowl in Camden County. (Laws of 1897, chap. 558, sec. 2.)

North Dakota.—Resident license fee increased to 75 cents; nonresident landowners required to secure resident licenses.

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[a] This law did not become effective until December, 1895. See Forest and Stream, XLV, p. 89, August 3, 1895.

1897. **Tennessee.**—Nonresidents of Grundy and Van Buren counties prohibited * from killing deer, quail (partridge) or wild turkey in those counties. (Laws of 1987, chap. 172.)

Wisconsin.—$30 nonresident license* and $1 resident license* required for hunting deer. Resident licenses required only in forty counties, designated as 'counties frequented by deer.' Full details in regard to issue of coupon licenses. (Laws of 1897, chap. 221.)

New Brunswick.—$20 nonresident and $2 resident licenses* required for killing moose or caribou. Nonresidents required to furnish $100 bond* with 2 resident sureties for observance of the game laws. (Acts of 1897, chap. 23, secs. 8–11.)

Quebec.—Nonresident license fees graded* according to a tariff established by the lieutenant-governor in council. Fee may be reduced in case of members of a fish-and-game club incorporated in the Province, provided club leases a hunting reserve. (60 Vic., chap. 25, sec. 5.)

1898. **Northwest Territories.**—$15 nonresident license, good only from August 1 to January 31, required for hunting any of the animals or birds mentioned by the ordinance. Guest license omitted. (Ordinance No. 40 of 1898, sec. 4; Con. Ord., 1898, chap. 85, sec. 20.)

1899. **Georgia.**—$25 market hunting license* required of any person killing or capturing for sale, except on his own land, deer, quail, wild turkeys, or doves. Not in effect until recommended by grand jury of the county. (Acts of 1899, p. 96.)

Illinois.—$10 nonresident county license, * good until June 1 following date of issue, allows shipment of 25 birds. (Laws of 1899, p. 231, sec. 26.)

Maine.—'September law,' * permitting nonresidents on payment of $6 and residents on payment of $4 to kill one deer in September, for food purposes only, in Aroostook, Franklin, Hancock, Oxford, Penobscot, Piscataquis, Somerset, and Washington counties. (Pub. Laws of 1899, chap. 42, sec. 21.)

Minnesota.—$25 nonresident license and 25-cent resident license* required for hunting deer, elk, caribou, or moose. All licenses good one year from date of issue and must contain description of licensee. (Laws of 1899, chap. 222, sec. 53.)

North Carolina.—$25 nonresident license for club houses in Dare County. (Pub. Laws, chap. 133, sec. 2.)

North Dakota.—$25 nonresident and 75-cent resident license reenacted. Exemptions same as in 1897, except that resident children under 16 are exempted. (Laws of 1899, chap. 93, sec. 4.)

South Dakota.—$10 nonresident hunter's license* required for big game or birds. (Laws of 1899, chap. 90, sec. 14.)

West Virginia.—$25 dollars nonresident county license* required for hunting in the State. (Acts of 1899, chap. 22, sec. 17.)

Wisconsin.—Nonresident license fee for hunting deer reduced to $25. $10 license* established for hunting all other game. Resident license extended to cover all game. Details of issue amended. (Laws of 1899, chap. 312.)

Wyoming.—Nonresident license fee increased from $20 to $40. $1 gun license* required of each resident hunting big game outside his own county. (Laws of 1899, chap. 19, sec. 14.)

New Brunswick.—Law of 1897 modified so as to dispense with bonding feature. (Acts of 1899, secs. 39–45.)

Newfoundland.—Nonresident license fees for killing caribou reduced, and licenses issued in three series: $40 license for 2 stags and 1 doe; $50 license for 3 stags and 1 doe; $80 license for 5 stags and 2 does. (Deer preservation act of 1899, secs. 7–10.)

1900. **Northwest Territories.**—$1 nonresident permits*, limited to 5 days, may be issued by any game guardian or the commissioner of agriculture to guests of residents hunting with their hosts. (Ordinances of 1899, chap. 23, sec. 3.)

Quebec.—Reenactment of nonresident license provisions of 1897. (62 Vic., chap. 24, sec. 1416.)

Iowa.—$10 nonresident county license,* permitting export of 25 birds or animals. (Laws of 1900, chap. 86.)

License fees to be credited to game protection fund. (Ibid., chap. 87.)

Maryland.—

Cecil.—Chapter 556, Laws of 1894, repealed, and $10 license required for use of sink box by residents on Elk and Bohemia rivers. (Laws of 1900, chaps. 372 and 444.)

Dorchester.—Nonresidents (except taxpayers) prohibited* from shooting or killing ducks, geese, brant, or swans within 1 mile of shore line of Middle or Lower Hooper Island without permission of landowners. (Laws of 1900, chap. 378.)

Garrett.—$25 nonresident license* required for hunting any game. (Laws of 1900, chap. 189.)

Somerset.—$9.50 nonresident license required for hunting any game. (Not needed by anyone invited and accompanied by a resident. (Laws of 1900, chap. 203.)

New York.—Nonresidents prohibited* from taking fish or game on fresh waters forming part of State boundary except under same conditions or fees as are required of citizens of New York in State of nonresident. (Laws of 1900, chap. 429.)

Virginia.—$10 nonresident license* required for hunting deer, partridges, pheasants, and wild turkeys in Alleghany, Augusta, Bath, Botetourt, Highland, or Rockbridge counties. License good only in county of issue, but permission of landowner obviates necessity for license. (Laws of 1900, chap. 1002, sec. 4.) $10 nonresident license required for hunting partridges (or quail) in Lee County. License carries privilege of shipping quail killed by licensee. (Ibid., chap. 330.)

Manitoba.—$25 nonresident license* required for hunting in the Province and issued at discretion of minister of agriculture and immigration. (63 and 64 Vic., chap. 14, sec. 18.)

New Brunswick.—$30 nonresident license required for hunting any animals or birds in Westmoreland County; fee for nonresident license for moose and caribou raised to $30. (63 Vic., chap. 39, sec. 3.)

Ontario.—$25 nonresident and $2 resident license provisions reenacted. $5 resident license* established for killing moose, reindeer, or caribou. (Game-protection act 1900, sec. 25.)

1901. **Illinois.**—$10 nonresident county license extended* to cover State. License must bear photograph of holder. (Laws of 1901, p. 212.)

Indiana.—$25 license* required of nonresidents. Permit required for hunting squirrels and wild fowl, October 1 to November 10. Issued without charge to residents and to nonresidents holding license. (Laws of 1901, chap. 203.)

Maine.—Repeal of the September deer law. (Pub. Laws, 1901, chap. 278.)

Minnesota.—License provisions of 1899 amended to permit residents to obtain licenses upon written (formerly personal) application to county auditor, received through office of any city, village, or town clerk before whom applicant appears. (Laws of 1901, chap. 342.)

Montana.—$25 big game license* and $15 game-bird license* required of nonresidents. Taxpayers exempt. (Laws of 1901, p. 135, secs. 19–24.)

1901. **Nebraska.**—$10 nonresident* and $1 resident licenses* required for hunting any animals or birds; resident license not required in county of domicile. (Laws of 1901, chap. 36, art. 4.)

Oregon.—$10 market-hunting license* required of nonresidents. (Laws of 1901, p. 231, sec. 38.)

Pennsylvania.—$10 license* required of nonresidents owning no land in Pennsylvania and who wish to hunt in the State. Guns and shooting paraphernalia used in violation of law may be seized. (Laws of 1901, chap. 67.)

South Dakota.—$25 nonresident and $1 resident * county licenses required for hunting big game. Licenses not to be issued before November 1 and good only during that calendar year. (Laws of 1901, chap. 132, secs. 10, 15.)

Tennessee.—Nonresidents of Bledsoe County prohibited * from hunting deer, quail (partridge), or wild turkey in that county. (Laws of 1901, chap. 213.)

Washington.—$10 nonresident license* and $1 resident license* required for hunting in the State; $20 extra for killing elk. License good only in county in which issued and required of all persons 16 years of age or over. Resident licenses may be obtained by citizens of Idaho and Oregon. (Laws of 1901, chap. 134, sec. 9.)

Northwest Territories.—$15 nonresident license, good for calendar year, required for hunting any big game or birds in the Territories whether protected by the ordinance or not. (Ordinances of 1901, chap. 32, sec. 3.)

1902. **Kentucky.**—$25 nonresident license * required for hunting in the State. (Laws of 1902, chap. 79.)

Louisiana.—Nonresidents prohibited from hunting in the State.* (Laws of 1902, chap. 65.)

Maryland—

Calvert.—$10 nonresident license * required for hunting rabbits, partridges, and woodcock. (Not needed by anyone hunting by invitation or under written permission on land of a resident.) (Laws of 1902, chap. 493.)

Cecil.—$5.50 nonresident license *. required for hunting rabbits, quail or partridges, grouse, woodcock, reedbirds, ortolan (rail), and summer ducks. (Not needed by anyone hunting by permission on land of a resident.) (Laws of 1902, chap. 434.)

Dorchester.—Nonresidents prohibited from hunting ducks, geese, brant, or swan within 3 miles of shore line of Middle and Lower Hooper Island without consent of landowners.

Frederick.—$15 nonresident license * required for hunting rabbits, partridges, pheasants, wild turkeys, woodcock, and ducks. (Not needed by anyone hunting by written permission on land of a resident.) (Laws of 1902, chap. 176.)

Garrett.—Nonresidents prohibited from selling quail, pheasants, partridges, wild turkeys, and woodcock within county. (Laws of 1902, chap. 116.)

Montgomery.—$15 nonresident license * required for hunting squirrels, rabbits, partridges, pheasants, wild turkeys, woodcock, and ducks. (Not needed by anyone hunting by written permission on land of a resident.)

Prince George.—$20 nonresident license required for hunting rabbits, partridges, pheasants, and woodcock. (Not needed by anyone hunting by written permission on land of a resident.)

Washington.—$10 nonresident license * required for hunting or fishing in Washington County, except on the Potomac River. Taxpayers, residents of Maryland or the District of Columbia, and anyone hunting by permission on the land of a resident of the county are exempt. (Laws of 1902, chap. 379.)

Wicomico.—$10 nonresident license * required for hunting any game. (Not needed by anyone invited and accompanied by a resident.) (Laws of 1902, chap. 222.

1902. **New Jersey.**—$10 nonresident license* required for hunting any game except waterfowl, snipe, and mudhens. (Laws of 1902, chap. 263,)

New York.—Nonresidents from States which require licenses, can kill game only under licenses* similar to those required of nonresidents in their own States. (Laws of 1902, chap. 77.)

Ohio.—$25 nonresident license* permitting export of 50 animals and birds. (Laws of 1902, p. 379.)

Newfoundland.—Nonresident license fee increased from $80 to $100 and limit placed at 3 stag caribou. (Preservation of deer act, 1902, sec. 13.)

Nova Scotia.—Nonresident license changed to 'general license to shoot game' and fee increased from $30 to $40. 'License to shoot small game,' $10. (Laws of 1902, chap. 23, sec. 2.)

1903. **Arkansas.**—Repeal of former license laws. Nonresidents not permitted to hunt in the State* except in Mississippi County. (Acts of 1903, chap. 162, secs. 4, 11.)

Colorado.—$25 nonresident license* required for hunting all game and $1 per day ($2 first day) for birds. $1 State hunting or resident license* established. (Laws of 1903, chapter 112, Division G.)

Florida.—$10 nonresident license extended to cover all game. Act not applicable to counties which have special game laws. (Laws of 1903, chap. 5251, sec. 6.)

Nonresidents prohibited from hunting in Santa Rosa County without permission of owner of land (ibid., chap. 5292), or in Lafayette County except upon payment of $1 per day* to game warden (ibid., chap. 5293).

Idaho.—$25 nonresident license* required for hunting all game, $5 license* for birds. $1 resident license* established. (Laws of 1903, p. 192, sec. 8.)

Illinois.—Nonresident license fee increased from $10 to $15 and requirement of photograph abolished. $1 resident license* established. (Laws of 1903, p. 214, sec. 25.)

Indiana.—$25 nonresident license required for hunting in the State; permits export of 24 birds. Permit for hunting squirrels October 1 to November 10 abolished; $1 required from residents for permit* for hunting waterfowl October 1 to November 10. Both nonresident and resident licenses must bear photograph of licensee. (Acts of 1903, chap. 225, secs. 4–5.)

Maine.—$15 nonresident license* required for hunting moose or deer. (Public Laws of 1903, chap. 99.)

$5 nonresident license* required for hunting teal, ducks, sea or shore birds in Knox, Lincoln, Sagadahoc, and Waldo counties; and towns of Brunswick, Freeport, and Harpswell in Cumberland County. (Public Laws of 1903, chap. 236.)

Minnesota.—Reenactment of former license provisions with addition of $10 nonresident license* for small game; resident license extended to cover all game animals and fee increased to $1. (Laws of 1903, chap. 336, secs. 39–41.) Repeal of license laws of 1895, 1899, and 1901. (Ibid., sec. 64.)

New Hampshire.—$10 nonresident license* required for hunting deer. (Laws of 1903, chap. 87.)

New York.—Nonresident license required for hunting game. Fee not less than that required of resident of New York in State of applicant; and, if none, amount to be fixed by commissioner of forestry, fisheries, and game. (Laws of 1903, chap. 475.)

North Carolina.—$10 nonresident license* required for hunting in the State. (Private Laws of 1903, chap. 337, sec. 10.)

$20 nonresident license* required for hunting quail, partridges, or wild turkeys in Cabarrus County. (Pub. Laws of 1903, chap. 675, sec. 2.)

1903. **Pennsylvania.**—$10 nonresident license* required of unnaturalized foreign-born residents who hunt in the State. (Laws of 1903, chap. 136.)

Tennessee.—Nonresident* and $25 market hunting licenses* required for hunting in the State. Fee for nonresident license same as resident of Tennessee is required to pay in State of applicant. (Acts. of 1903, chap. 169, secs. 9, 14.)

Utah.—$10 nonresident gun license * required for hunting any game animals or birds in the State. (Laws of 1903, chap. 116, sec. 2.)

Virginia.—$10 nonresident license * required for hunting in the State. Children and guests of resident landowners exempt, but host must hunt with his guest and must not, directly or indirectly, receive any compensation from him. (Acts 1903, chaps. 227, 286, sec. 2070c.)

Washington.—Uniform $1 county license * required of residents and nonresidents hunting in the State. (Laws of 1903, chap. 94.)

West Virginia.—Nonresident license extended * to cover the State and fee reduced from $25 to $15. (Acts of 1903, chap. 46, sec. 17.)

Wyoming.—Nonresident gun license fee increased from $40 to $50. (Laws of 1903, chap. 44, sec. 8.)

New Brunswick.—Reenactment of license provisions with addition of 25 cent, resident license to hunt any game in Westmoreland County. (Con. Stat., Vol. I, chap. 33, secs. 44–46.)

Newfoundland.—Nonresident license fee reduced from $100 to $50. (Acts of 1903, chap. 8, sec. 3.)

Northwest Territories.—$25 general nonresident license and $15 bird license* required of nonresidents for hunting in the Territories. General license permits export of trophies of big game. (Ordinances of 1903, 2d sess., chap. 29, sec. 18, passed Nov. 1, 1903.)

1904. **Kentucky.**—Nonresident license fee reduced from $25 to amount required of citizens of Kentucky in State of applicant.* (Acts of 1904, chap. 48.)

Louisiana.—$10 nonresident license * substituted for absolute prohibition; same license required of unnaturalized foreign-born residents. $25 market hunting license established. (Laws of 1904, chap. —.)

Maryland—

Allegany.—$10 nonresident license * required for hunting any game. (Laws of 1904, chap. 439.)

Anne Arundel.—Previous laws modified so as to remove restrictions from nonresident owners of land in county and permit nonresident not owning land to hunt if invited by a resident and hunting with him on his own land or to shoot wild fowl from a licensed blind on invitation of owner.

Baltimore.—$5 nonresident license required for hunting squirrels, rabbits, partridges, pheasants, woodcock, and jacksnipe. Photograph of holder must be attached to license. Nonresident taxpayers and persons hunting by written permission on the land of a resident exempt. (Laws of 1904, chap. 542.)

Patuxent River.—$10 license * for hunting birds required of nonresidents, except members of certain incorporated hunting clubs, of not more than 30 members, owning or leasing land within one mile of the river and improved by a club-house. Licensee must also secure written permission of owner of land adjacent to water on which he hunts. $2.50 pusher's license required of residents of Maryland pushing, paddling, or conveying anyone hunting ortolan, rail, reedbirds, ducks, or geese. (Laws of 1904, chap. 509.)

Somerset.—$10 nonresident and $1 resident license* required (except in case of resident landholders) for hunting squirrels, rabbits, muskrats, quail or partridges, doves, woodcock, ducks, and geese. (Laws of 1904, chap. 198.)

1904. Ohio.—$15 nonresident license, good until December 1 following date of issue, required for hunting in the State; fee formerly $25. (Laws of 1904, p. 474, sec. 22.)

Nova Scotia.—$30 nonresident license required for hunting moose. Licensee may take with him from the Province any moose or caribou which he has lawfully killed. (Laws of 1904, chap. 14.)

REFERENCES TO ARTICLES ON NONRESIDENT LICENSES.

Much discussion of the license system has appeared in sportsmen's journals in recent years, mostly in the form of brief articles and notes, and the following list of titles, arranged chronologically, has been prepared for the convenience of persons who may desire to examine this material. No attempt has been made to give a complete index of the literature of the subject, or to do more than to indicate some of the more important articles which have been consulted in the preparation of this bulletin:

1875. A member, Game Protection in New Jersey. [Defense of the charter of the West Jersey Game Protective Association.] <Forest and Stream, V, p. 188, Oct. 28, 1875.

Editorial, Game Protection—The Florida Snap Law [Nonresident license act of 1875]. <Forest and Stream, V, p. 328, Dec. 30, 1875; see also same volume, pp. 377–378.

1880. C., Shooting Dogs and Taxing Guns. [Advocates $10–$15 Nonresident Gun License good throughout the State or in contiguous counties.] <Forest and Stream, XIII, p. 1012, Jan. 22, 1880.

1887. Editorial, The Arkansas Law Unconstitutional. [Decision of Craighead County Circuit Court.] < Am. Field, XXVII, p. 49, Jan. 15, 1887.

Anonymous, Non-Resident Shooting in Poinsett County, Arkansas. [Act of 1875 declared unconstitutional by Poinsett County Circuit Court.] <Am. Field, XXVIII, pp. 3–4, July 2, 1887.

1895. Editorial, Non-Resident Discriminations. <Forest and Stream, XLIV, p. 61, Jan. 26, 1895.

1896. Editorial, A New Jersey Scheme [for requiring nonresidents to obtain $10 licenses to hunt or fish]. <Forest and Stream, XLVI, p. 129, Feb. 15, 1896.

Robbins, C. E., North Dakota Non-Residents [fail to secure writ compelling auditor to grant licenses for same amount charged residents]. <Forest and Stream, XLVI, p. 277, April 4, 1896.

Editorial note, Snap shots [—the Michigan License System]. <Forest and Stream, XLVII, p. 1, July 4, 1896.

1897. Hough, E., The Wisconsin Deer Licenses. [Summary for 1897]. <Forest and Stream, XLIX, p. 487, Dec. 18, 1897.

1898. Talcott, William A., Jr., [Constitutionality of] Non-Resident Licenses. <Forest and Stream, L, pp. 205–206, Mar. 12, 1898.

Editorial note [Failure to pass a $2 Non-Resident License Law in New Jersey]. <Forest and Stream, L, p. 281, April 9, 1898.

Hough, E., [Abuse of] Wisconsin Deer Licenses. <Forest and Stream, LI, p. 349, Oct. 29, 1898.

1899. Cunningham, G. W., Michigan Deer [and the Operation of the License Law]. <Forest and Stream, LII, p. 10, Jan. 7, 1899.

1899. Editorial note [The Feeling engendered by Non-Resident Licenses]. <Forest and Stream, LII, p. 61, Jan. 28, 1899.

Editorial, The Wyoming Guide [and Non-Resident] License System. <Forest and Stream, LII, p. 241, April 1, 1899.

Editorial, [Non-Resident Licenses] In Florida. <Forest and Stream, LII, p. 401, May 27, 1899.

Editorial, Non-Resident License Laws are Constitutional. <Forest and Stream, LIII, p. 181, Sept. 2, 1899.

Hough, E., Illinois [Non-Resident License] Law Sustained. <Forest and Stream, LIII, p. 406, Nov. 18, 1899.

Editorial, The Non-Resident License Law Upheld. <Am. Field, LII, p. 401, Nov. 18, 1899.

1901. Johnson, F. C. [Some Hardships of Non-Resident License Laws.] <Am. Field, LV, p. 187, Mar. 9, 1901.

Anonymous, [Defense of] Non-Resident License Laws. <Am. Field, LVI, p. 206, Sept. 14, 1901.

1902. West Virginian, Hunting Licenses—Non-Resident and Resident. <Am. Field, LVII, p. 216, Mar. 8, 1902.

Editorial Note, Non-Resident License Laws. < Am. Field, LVIII, p. 145, Aug. 16, 1902.

Editorial, [A Fund] To Test the Non-Resident Law. < Am. Field, LVII. p. 593, Dec. 20, 1902.

Nowlin, D. C., Non-Resident Hunting Licenses [in Wyoming and their Results]. < Forest and Stream, LIX, p. 105, Aug. 9, 1902.

1903. Anonymous, Game Law Declared Unconstitutional [Decision of Crittenden County Circuit Court, Arkansas, on the Non-Resident Law of 1903]. < Am. Field, LX, p. 52, July 18, 1903.

Editorial, Non-Resident Land Owners [under the Arkansas Law]. < Am. Field, LX, p. 145, Aug. 15, 1903.

Anonymous, [Decision of the Superior Court of Spokane County, Washington, on the Non-Resident Law of 1903]. < Field and Stream, VIII, p. 501, Oct., 1903.

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HUGH P. BAKER, Dean

PRELIMINARY REPORT

ON

DISEASES OF FISH IN THE ADIRONDACKS

A CONTRIBUTION TO THE LIFE HISTORY OF CLINOSTOMUM MARGINATUM

BY

DR. W. M. SMALLWOOD

Professor of Comparative Anatomy in Syracuse University and
Forest Zoologist of The New York State College of Forestry in 1912 and 1913

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FIELD NOTES ON CLINOSTOMUM MARGINATUM WITH A CONTRIBUTION TO ITS LIFE HISTORY.

Preliminary Report — W. M. SMALLWOOD.

It is common knowledge among those who frequent the several Adirondack Ponds during the summer months that the perch and often the bass are considered unfit for food because of the numerous parasites in their skin and in their flesh. The usual term heard from the guides is "grubby" when referring to the summer perch. A number of woodsmen have been consulted in reference to the time of the spring when they have first noticed the "grubs" in the perch and as to how long they remain. The writer has yet to find any one who knows anything definite concerning either of these important phases of the problem but all agree that in the ponds that have the worst infected fish in summer, perch free from parasites are caught in the winter and early spring.

For the past ten years the writer has usually reached the Adirondacks about the middle of June and by that time most of the perch are unfit for food as a result of parasitism. This is a condition, however, which seems to develop rather rapidly, possibly in about two weeks, for usually no trouble is experienced the last of May in securing plenty of perch entirely free from skin and flesh parasites.

Before any remedial measures of lasting benefit can be devised we must know the conditions under which these annoying parasites live and how they come to the adult stage. This is a report of a study of some of the more important biological conditions involved in an analysis of the problem. As a contribution to the life history, it is to be regarded as of a preliminary nature only.

Two species of Trematode parasites are found, the larger being the common flat-worm, Clinostomum marginatum, and the smaller one of the genus Holostomum. The phrase "grubby" perch has reference to the presence of Clinostomum which is usually imbedded in the flesh and shows as a whitish spot through the skin. Field studies covering hundreds of specimens show that these Trematodes (C. marginatum) are to be found on all parts of the body. On June 24, 1913, forty-four perch were studied with the following distribution of the parasites as seen through the skin: head, 38; gills, 5; trunk, 82; tail, 78. On August 7, 1913, one perch was taken which had over 30 fully developed Clinostoma encysted around the mouth cavity alone.

Judging from one summer's study, the number of adult parasites in a perch varies from month to month. This seemed to be noticeable early in August when a smaller average number of the "grubs" was found than late in June. Certainly the perch secured in September and especially in October were not as extensively infected as those taken early in the summer.

The ponds studied this past summer were selected because previous experience led me to believe that the perch were practically free from "grubs" in certain ponds. All of them are located in Franklin County and in Townships 19 and 20. Three pairs of ponds were selected as follows: West and East Pine Ponds; Copperas and a small mud pond; Follensby Clear and a nearby pond called Green Pond. The perch in East Pine, Copperas and Follensby Clear Ponds are and have been badly infested with Clinostoma for years, while in West Pine, in the mud pond near Copperas and in Green Pond, one may catch a fine mess of perch nearly all of which will be entirely free from parasites. All six of these ponds are practically spring-fed ponds. Copperas, Follensby Clear and East Pine each has an outlet. The water varies in depth from shoals so shallow that one must pole the boat to large areas 30 feet or more in depth. Some of the ponds are almost entirely free from weeds or lily-pads while others have many aquatic plants. The bottoms are muddy, sandy or gravelly. West Pine and East Pine Ponds are separated by a ridge some 300 feet wide; a much lower ridge of less than 250 feet separates Copperas and the mud-pond near it; while a strip of land of about 400 feet lies between Follensby Clear and Green Ponds. No constant physiographic factor was observed as belonging either to the ponds where the fish were parasitized or to those where they were non-parasitized. (Herons and Kingfishers were as frequently seen flying from one as from another). The shallow, muddy-bottomed pond near Copperas Pond contrasts strongly with the gravelly bottom and clear water in Green Pond, and yet 80 per cent to 90 per cent of the perch taken from each were free from parasites.

Where does Clinostomum spend the winter? This question cannot be definitely answered at this writing. But the fact that perch are secured during the winter free from "grubs" would indicate that they do not remain in a passive state in the perch until eaten by some bird as held by Osborne '11. Perch packed in moss and expressed from Lake Clear, N. Y., to Syracuse, in the middle of September, 1913, contained about ten parasites each, but on arrival more than two-thirds of them had escaped from the body of the dead perch and were themselves dead in most instances. They were found on the skin of the perch (completely extended). But not all of them had emerged and those still encysted in the muscles were alive when released. Examining the perch it was easy to discover where the parasite had crawled out. Those in the cyst were about ready to escape because in many instances when the whitish spot was pressed upon the parasite would emerge. The walls of the cyst and the muscles immediately in contact with it were partly dissolved indicating that Clinostomum has the power to cause the walls of the cyst, the surrounding muscles and overlying skin to disintegrate. This would seem, moreover, to be a natural process but is one that was not observed to take place during the summer when dead perch were kept several days.* This may be the normal process employed by the worms in the fall to free themselves from the perch, as fish free from parasites are found in the winter and early spring. Certainly this method of escaping throws new light on their habits and suggests that fish-eating birds are not necessary to complete their life history. For parasites probably do not make their escape in the fall until after most of the birds that feed upon perch have migrated, and even if the birds had not migrated there would be small chance of the parasites being eaten after they reach the water. But where and how the adult Clinostomum, its eggs or larvae spend the winter is unknown at present.

One often hears the guides say that the perch become "grubby" as soon as the water warms up in the spring. All of the ponds examined thus far are spring-fed and into some a cool brook empties or on the shore one or more springs are to be found. This is particularly the case at the upper end of Copperas where several springs are to be found, the water of which many campers have enjoyed. At the foot of a large tree a splendid spring runs into Copperas and some of the worst infected perch found during the summer were taken from the shore while standing beside this spring. Wells driven six or eight feet deep on the islands in Follensby Clear supply campers with plenty of very cool water and yet the perch in the surrounding ponds are badly parasitized. It is certain that these spring-fed ponds harbor parasitized perch even where the water is coolest.

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* This same phenomenon was again observed May 28, 1914. This time the parasite escaped within an hour after the fish were caught. I believe that these parasites had remained in the flesh of the perch all winter.

The food of the perch was examined with some care on each trip in the several ponds kept under observation during the summer. The first dozen fish examined gave as much variation as was found during the entire summer. Snails, caddis-fly larvae encased in tubes of sand or sticks, an occasional dragon-fly larva and small minnows constituted the range of food for the perch as observed in these ponds. One perch was taken that had recently eaten a minnow (probably Pimephales notatus) which had a Clinostomum inbedded in the tail. The minnow was partially digested and one Clinostomum lay exposed and dead in the flesh of the minnow. It is well known that the pickerel feed upon the perch, and finally after much endeavor one was taken which had recently fed on a parasitized perch and in which the conditions were ideal for determining the fate of Clinostomum in the stomach of the pickerel. It was found on the mucous membrane of the stomach and was dead. In these two observations both parasites had the characteristic dull whitish appearance of the dead worm. The digestive tracts of several pickerel were examined critically and in no instance were any living Clinostoma found. It would seem from these two observations that the Clinostoma encysted in the flesh of fish when eaten by the perch or pickerel are quickly killed in the stomach and eventually digested.

The genus of flatworms known as Clinostomum has been familiar to American Trematode experts since Joseph Leidy in 1856 first noticed a cyst on the gills of the sunfish. Osborne, '11, summarizes the several contributions that have been made to the distribution and occurrence of Clinostomum marginatum in North America. The several observers* report the finding of this parasite in the intestine of the pike Esox, upon the gills or encysted in the muscles of the perch Perca flavescens, in two species of bass, Roccus lineatus and

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* Linton, E. R., 1910. The diagnosis of a case of parasitism in the brook trout. Proc. Seventh Internat. Zool. Congress, Boston, 1907.

* Osborne, H. L., 1911. On the distribution and mode of occurrence of Clinostomum marginatum, a trematode parasite in fishes, frogs and birds. Biol. Bul. Vol. 20.

* Cort, W. W., 1913. Notes on the Trematode genus Clinostomum. Trans. Am. Micr. Soc. Vol. 22.

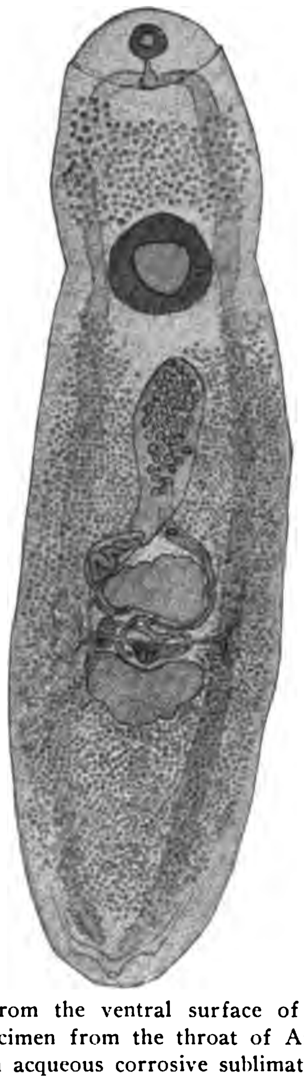


FIGURE 1. View from the ventral surface of Clinostomum marginatum, from a specimen from the throat of Ardea herodias, fixed under compression in acqueous corrosive sublimate, stained in borax-carmine, magnified twelve diameters. From Osborne. (Reproduced by permission of author and Wistar Institute of Anatomy.)

Micropterus dolomieu, in the brook trout, Salvelinus fontinalis pallidus, and in two species of sunfishes, Eupomotis pallidus and Channobryttus gulosus. I can add to this list the common bullhead, Ameiurus nebulosus, and the blunt-nosed minnow, Pimephales notatus. The perch and bass of the Adirondack ponds are usually infested with this parasitic pest throughout the summer. I have been told, but have not seen specimens as yet, that the perch in other parts of the State are parasitized with this same flatworm. The general distribution of Clinostomum, not only in New York State, but generally in the Eastern part of the United States and in many places in Canada, makes it very desirable that some means be devised for preventing its further spread and reducing its damage in such a wide extent of territory. In the Adirondacks practically all of the perch and many of the bass are rendered unfit for food. Certainly the problem is one of some economic importance.

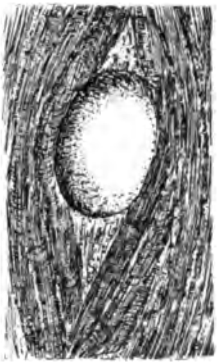


FIGURE 2. A Cyst of Clinostomum marginatum in place among the muscle fibers of the bass, from Nebish, Michigan, from a glycerine preparation after teasing off part of the muscular tissue. From Osborne. (Reproduced by permission of author and Biological Bulletin.)

Three observers have reported finding the adult worms in the digestive tract of the bittern, Botaurus minor, in the heron, Ardea herodias, in the herring gull, Harus argentatus, the stork, Mycteria americana, and the black-crowned night heron, Mycticorax naevius.

The encysted Clinostomum has a characteristic appearance in the muscles of the fish where it occupies a space in the endomysium. The worm fills the cyst and has a whitish appearance. Within the cyst the worm is bent twice, both times with the ventral surface outward. When the living worm is released from the cysts, it begins to crawl about on the skin of the fish or on one's hand. Osborne distinguishes two poses which he designates as the "suctorial and swimming." It does not seem to me that these are really as distinct as he points out, for when the animal is on the skin of the fish it makes a variety of movements, chiefly with the anterior end of the body, that might belong to any one of several poses. Unfortunately no experiments have ever been tried to determine just what the worm would do when brought in contact with another living fish in the water.

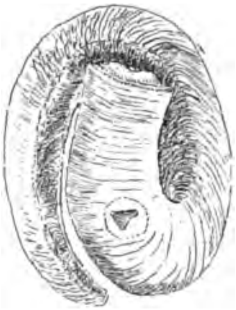


FIGURE 3. Drawn from a specimen of Clinostomum marginatum which had been removed from the cyst after fixation in alcohol and relaxed by slight maceration; from a bass taken at Nebish, Michigan. From Osborne. (Reproduced by permission of author and Biological Bulletin.)

The problem of how and at what spot these worms enter the body of the fish is still unknown.

Osborne gives a table of measurements for the adult in which the length ranges from 3 millimeters to 8 and the width from .9 to 2. millimeters. The worms that I have taken from the perch, particularly those taken in September, are much longer, some being 10 mm. long; the width, however, ranges about as given by Osborne. The most of my specimens are from 5 to 8 mm. long with several 10 mm. These long specimens were taken throughout the summer. As suggested in the early part of this study, I am inclined to believe that the small worms about 3 mm. long may be considered as young worms and that they will grow longer before making their natural escape from the body of the perch in the late fall. The mere fact that the reproductive elements have developed does not necessarily mean that the worm is full grown, because I have found the gonads differentiated in some of the smaller specimens even before the anterior sucker is well developed.

With a hand lens one can easily identify the two suckers, the oral and ventral. Osborne says correctly that "the mouth opening lies in the center of the oral field and leads into the cavity of the oral sucker. The sucker is nearly spherical and is much smaller than the ventral sucker, measuring 0.28 mm. long and 0.25 mm. across. It has the usual cuticular lining and heavy muscular walls composed of fibres running in various directions."

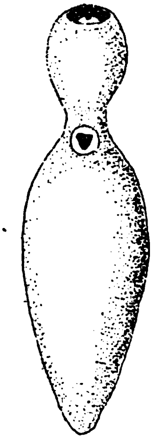


FIGURE 4. Sketch of living animal in "suctorial pose" as seen from the ventral side, from bass taken at Nebish, Michigan. From Osborne. (Reproduced by permission of author and Biological Bulletin.)

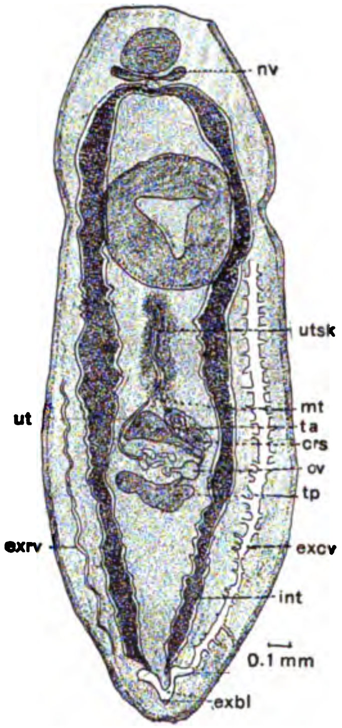


Figure 5. A partly schematic view from the dorsal side, combining facts from several sections of a frontal series. The vitellaria are not yet developed, the uterine sack is not dilated, the excretory collecting vessel is omitted from the right side and the recurrent vessel from the left, parts on different levels are shown on the same level. Magnified twenty-seven diameters. Crs. Cirrus sac; Exbl. excretory bladder; Excv. collecting vessel of excretory system; Exrv. recurrent vessel of excretory system; Int. intestine; mt. metraterm; nv. nerve collar; ov. ovary; ta. anterior testis; tp. posterior testis; ut. uterus; utsk. uterine sack. From Osborne. (Reproduced by permission of author and Wistar Institute of Anatomy.)

Osborne describes the several organs in the digestive system as follows:

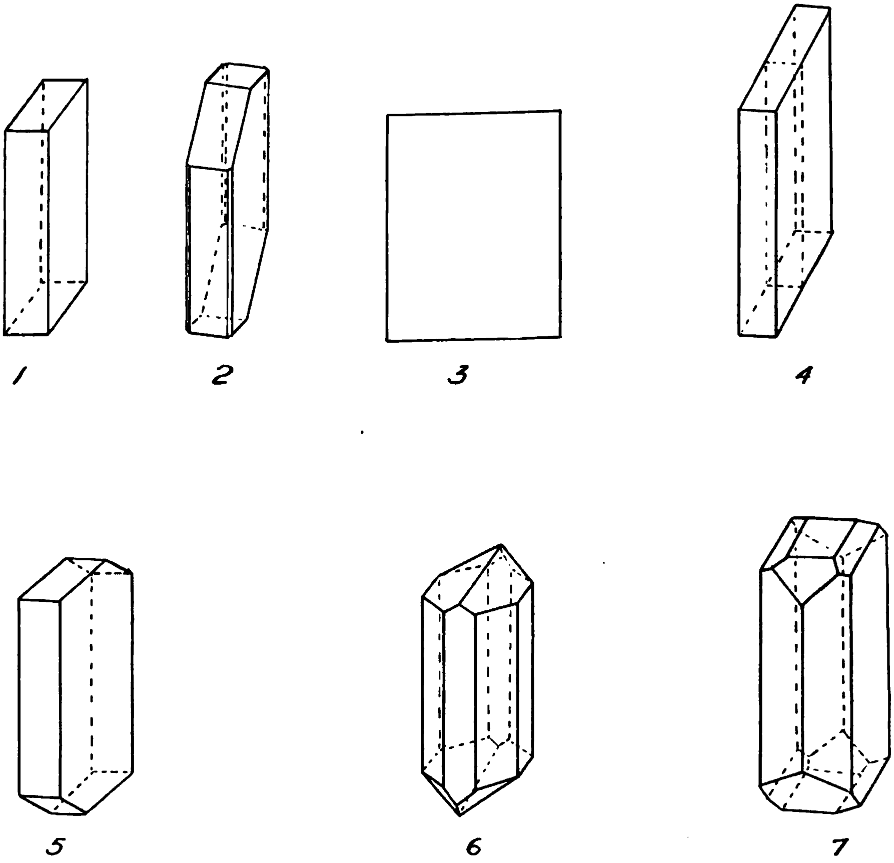
"The pharynx which is generally present in trematodes and usually follows close after the oral sucker, is entirely wanting. There is a short tube immediately behind the oral sucker which, after running ventrally a short distance, makes a dorsal bend to meet a transverse portion of the intestine. This is the esophagus. The intestine consists of a part crossing the body transversely which after bending, continues as the two long lateral coeca. The wall of the intestine is contractile; in life its movements are very conspicuous. The lumen is filled with a fine grained material lemon yellow in color. This flows back and forward, streaming, the pouches empty themselves of it or fill with it and the contractions of the wall may obliterate the intestine entirely for a moment. The cavity of the intestine of the worms obtained from the bass cysts is filled with thin, flat, four-sided crystalline bodies. As soon as the worm has escaped from its cyst the strong peristaltic contractions already mentioned force this substance backward and forward. At frequent intervals portions of it are expelled from the body through the mouth. In worms obtained from the heron this material is not found in the cavities of the intestine. In such worms on the contrary the intestine has been found to contain a coagulated fluid substance with blood corpuscles scattered through it, which upon careful examination were found to be identical with blood corpuscles taken from the heron."

The color of the fluid in the intestine is not uniformly a lemon color but may be a dark brown to almost black. The amount of substance in the two lateral coeca seems to vary in the several worms examined and in the two coeca of an individual worm. A study of the contents of the coeca in the killed specimens is not satisfactory but I am able to make out roundish bodies and a matrix which readily absorbs stain.

Sections of the intestine filled with these bodies were submitted to Dr. W. A. Groat, Professor of Microchemical Analysis of the College of Medicine, Syracuse University, and he was unable to find any evidence of hemoglobin or the products of hemoglobin in these bodies.

Professor Charles H. Richardson, of the department of mineralogy, examined this material and reports as follows:

"The stained material was uniformily dark during the complete rotation of the stage of the petrographic microscope under polarized light. No clue as to composition was afforded by this polarization. The material was then treated with water at normal temperature



Original by Richardson

FIGURE 6. 1. Composed of three sets of pinacoidal planes. 2. Composed of the same three sets of pinacoidal planes but modified by an orthodome. 3. The face of a prismatic form where the inclination of the clino axis is less than one degree. 4. Twin crystals where the twinning place is the ortho axis. 5. Composed of two sets of pinacoidal planes and two ortho domes. 6. A prismatic form terminated at either extremity by a pyramid. 7. A prismatic form terminated by a basal pinacoid, two clino domes and an ortho dome. C. H. Richardson.

and failed to pass into solution. It was further treated with concentrated nitric acid when the stained product passed immediately into solution. The nitric acid was allowed to evaporate completely. Upon a re-examination of the slide some thirty or more well defined minute crystals appeared. These were magnified 84 diameters and carefully studied under polarized light. The first six forms represented in the above legend were unquestionably present and perfectly formed. The seventh was apparently present. The forms are all simple and in the monoclinic system of crystallization. The crystals are soluble in water.

"Commercial hippuric acid is slowly soluble in water, readily soluble in concentrated nitric acid, and similar crystals form upon the evaporation of these solutions. All of the forms represented in the diagram have been duplicated with commercial hippuric acid."

The study of sections from several animals reveals the fact that these bodies exist in the tissues of the intestinal wall and adjacent cells as well as in the lumen. When the stain is extracted, there frequently remains a deeply staining center. If these bodies were crystalline as Osborne holds, the stain would appear on the edge or penetrate along the planes of cleavage. This it does not do. If it can be shown that these bodies have accumulated during the encysted period of the worm, then it will indicate an unusual amount of metabolic activity for an animal in a supposedly quiescent state.

Clinostomum marginatum possesses both organs of generation, the testes and ovary. In this sense it is to be regarded as an hermaphrodite. The question of whether the eggs are fertilized by the sperms grown in the same animal no one has attempted to answer because the facts are unknown. From figures one may see the position of the two testes and that a convoluted (much coiled) tube serves to carry the sperms to the exterior. Osborne says that the testes are made up of cells, each of which, in some bass worms, is almost completely filled by the very large nucleus. This is poor in chromatin and has a very large, readily staining nucleolus which indicates the inactive stage preceding development of the sperms. In other bass specimens are cells showing various phases of sperm transformation. In the worms from the heron the testes contain fully developed spermatozoa scattered among the active cells. The ovary is a small oval sack located between the testes. The oviduct eventually passes externally to the anterior testes on the left side and empties into a large sack termed the uterine sack. The uterine sack may be greatly distended in mature worms or as seen in optical section appear as a

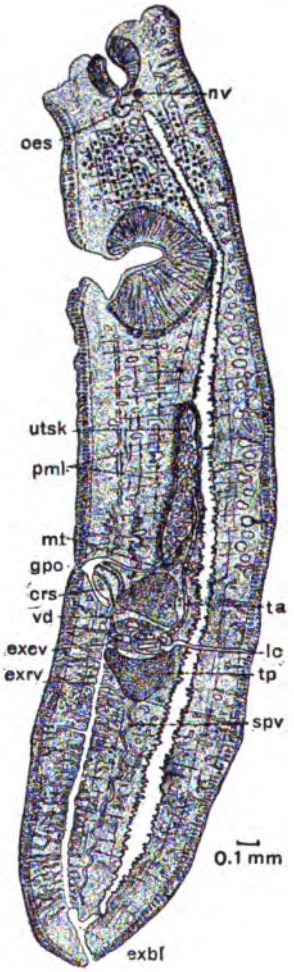


FIGURE 7. View combined from sections of a sagittal series, showing together organs which are on different levels, mouth, ventral sucker, genital organs and excretory pore are median while the intestine and the collecting and recurrent excretory vessels are lateral. Magnified twenty-seven diameters. Crs. cirrus sack. Exbl. excretory bladder; excv. collecting vessel of excretory system; exrv. recurrent vessel of excretory system; gpo. genital opening; lc. canal of Laurer; mt. metraterm; nv. nerve collar; oes. oesophagus; pml. longitudinal muscles of the parenchyma; ta. anterior testis; tp. posterior testis; utsk, uterine sack; vd. vas deferens. From Osborne. (Reproduced by permission of author and Wistar Institute of Anatomy.)

slit. The sack is connected with the exterior by a duct extending from its posterior end.

A better appreciation of the difficulties involved in unravelling the life history of Clinostomum may be had if we outline what is known about the development of some of the other distomes. This group of flatworms is exclusively parasitic throughout life in the early and mature stages. The egg is enclosed in a chitinous shell and supplied with a mass of food cells. These eggs may be attached to the host. In one species (Cryrodactylus) the eggs develop in the body of the parent. The egg of Polystomum hatches six weeks after oviposition, producing a minute larva (.3 mm. long) which swims about freely; but if in twenty-four hours it does not become attached to a tadpole, it dies. After finding a suitable host it attaches itself and eventually reaches the bladder by traveling the length of the digestive canal. Here it remains three years before attaining maturity.

The development of distomes is indirect and the life history often very complicated. From the egg a larva arises which enters a temporary host. Gamble says that " the larva gives rise by a peculiar process to numerous individuals of a second larval form, and these usually produce a third form from which the minute immature trematode is developed." Thus a large number of sexual individuals may be derived from a single egg. The larvae usually live in molluscs, the mature worm in vertebrates and the immature but metamorphosed trematode in either host.

The majority of distomes are hermaphroditic and many are capable of self-fertilization. In such cases the sperms ripen first and pass over into the uterus. The so-called egg consists of a fertilized ovum and a mass of yolk-cells. After the larva becomes attached to its host, it may degenerate into a sac-like structure full of germ cells and in this stage is designated a "sporocyst." The masses of cells in the sporocyst may give rise to another generation of larvae. Certain structures become characteristic of this larva, such as a pharynx and straight digestive sac. The name "redia" has been given to this second larva. The rediae move about in the sporocyst and eventually burst the wall, thus escaping. The free rediae may give rise to a number of new individuals, the " cercariae." Gamble* states that "the cercaria is just visible to the naked eye and has an oval or discoidal body and usually a long tail of variable form." The body of the cercaria contains in miniature all the organs of the adult.

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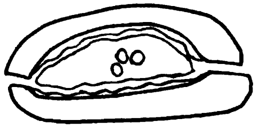
*Gamble, F. W. 1910–11. Trematodes.
The Encyclop. Brit. 77 edition, Vol. XXVII.

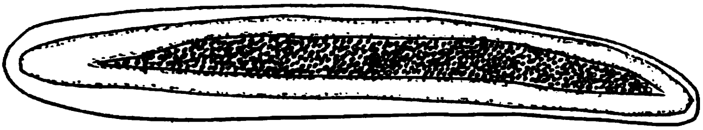
From the above it may be readily inferred that the task of working out the full life history of many Trematodes is beset with many difficulties. All of the stages are subject to considerable variation and in many the life history is much condensed or abbreviated. First, one must know how many hosts are necessary for the complete development of Clinostomum marginatum. The size and form of the so-called mature worms in the throat of birds does not differ from those released from the cysts in the fish. Some of those which I have taken were 10 mm. long and exceed in length those found in birds. Thus far very little information has been gained from the study of these worms in birds. This is mostly due to the irregular and in most cases to the accidental manner in which the birds have been studied so far as the problem of fish parasites is concerned. The writer hopes that permission may be obtained to make a systematic examination of the herons in the Adirondacks this coming summer. If they prove to be the real distributors of these parasites, there is certainly an additional reason why the law which gives them such complete protection should be changed.



Original by W. M. Smallwood

FIGURE 8. Larval flatworm with a pair of intestinal tubes with a few round bodies forming between them. .03 mm. long; .06 mm. wide. From snail, Amnicola limosa. Original.

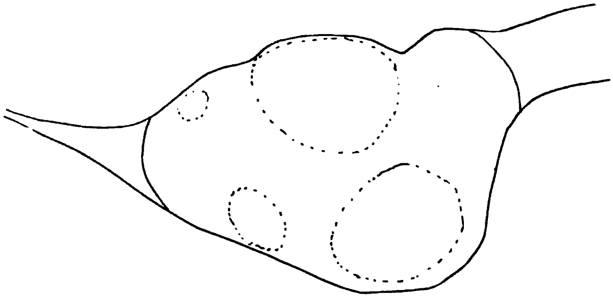
Enough observations are now on record to make it reasonably certain that Clinostomum may live for an undetermined length of time in several of the water birds. But where the early stages are passed is unknown. The wide distribution of this parasite suggests that one of several invertebrate hosts may satisfy the requirements of its larval development. The snails taken from the stomach of the perch in East Pine Pond were identified by Doctor Dall as Amnicola limosa Say. This nail is oviparous, depositing a single egg in each capsule. The snails, together with other animals, were placed in formalin to be later examined. Some of them were partly digested and no special pains were taken to insure careful fixation. When the different organs were studied for possible larval stages, some of the snails revealed the presence of a large number of brownish bodies in the liver. These bodies are elongated and in a few instances show what I believe to be a pair of intestinal tubes. The action of the digestive processes in the stomach of the perch which breaks down the tissues of the snail does not have any effect on them. The body seems to be covered with a thick cuticle and after fixation with formalin I am unable to make out any cells. This might be taken by some to argue against their being separate organisms. As further evidence of the correctness of this interpretation, three flatish worms were found .7 mm. in length while dissecting the organs of a snail preparatory to making sections. The snail which contained these three worms was so macerated as a result of the digestive changes that the organs fell to pieces when taken from the shell. I feel reasonably certain that each of these worms contains a pair of digestive tubes, while the space between the branches of the intestinal tract is packed full of round bodies. The color of these worms is identical with those found in the liver. Their reaction to stains is the same, so that those found in the liver impress one as being but a younger stage. The fact that these brown bodies do not occur in all of the snails and the further fact that larger specimens were secured suggests that I have part of the life history of one of the flatworms, but which one cannot be stated at present. The crucial test will come when the living tissues are examined which I plan to do next summer.



Original by W. M. Smallwood

FIGURE 9. Later larval stage of flatworm with the intestinal tubes clearly defined and the intervening space packed full of round bodies similar to those shown in figure 8. 1.2 mm. long, .2 mm. wide. From snail, Amnicola limosa. Original.

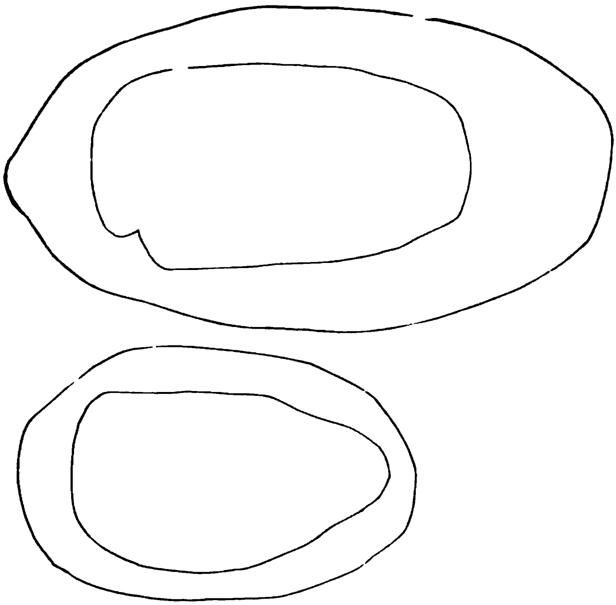
It is possible that the larval stages exist in the muscles of the perch. When the muscles of the perch are carefully examined, especially along the back, one frequently finds a number of small cysts. Osborne has given a careful description of the cysts of Clinostomum marginatum as to number of layers, the amount and arrangement of the connective tissue, etc. His account of the parts of the cyst apply to these small cysts both as to general appearance and as to structural detail. I have thus far found it very difficult to get the fixing fluids to penetrate this cyst and when I have attempted to remove the cyst, the worm has been greatly distorted and torn. These cysts are not all of the same age, for part of them are oval with a blunt process on one or each end that is in contact with the muscle. These younger cysts do not have the walls of the cyst well developed as the stain will penetrate as it will not in the older ones. I have not been able to section the latter in paraffin because the alcohol and clearing oil as well as the paraffin did not penetrate. So far as I have been able to determine with the limited amount of material at my disposal, two distinct stages are represented. In the older cysts, the young worms have a well developed oral sucker, digestive and reproductive organs. I have not been able to homologize all of the structures with those in the adult due to unsatisfactory sections but so far as I have gone the results indicate that this is a young stage of the adult. The younger cysts are filled with a mass of loose cells and connective tissue containing from one to three distinct round bodies. These round bodies take a deeper stain and vary much in size. Each is surrounded by a concentrically arranged layer of connective tissue. So far as has been



Original by W. M. Smallwood

FIGURE 10. One of the smallest and youngest of the cysts found in the muscles of the perch. There are four round bodies which take a deep stain but the cells are not as yet organized into definite organs. 8 mm. long, .6 mm. wide. Original.

determined, these bodies appear to be of growing larvae but as .yet the cells are not arranged into organs. I have found these cysts in the muscles as late as October 21st. An attempt is being made to study these conditions throughout the winter and early spring. I expect to find that these cysts remain in the muscles all winter and during the early spring transform into the large worms with their well known cysts.



Original by W. M. Smallwood

FIGURE 11. Older cysts from muscles of perch in which the several layers in the wall of the cyst are present and the larval worm has a clearly defined digestive and reproductive system. The presence also of the oral and ventral suckers clearly indicates that these are early stages of Clinostomum marginatum. In the large one the cyst is 1.1 mm. long, .6 mm. wide, as compared with 3.5 mm. long for those described by Loess. The larval worm being .72 mm. long and .4 mm. wide. Small specimen has a cyst .8 mm. long, .5 mm. wide. Larval worm .65 mm. long, .35 mm. wide. Original.

SUMMARY.

1. The physiographic conditions of the several ponds studied do not explain the distribution of parasites in the perch. The extensive distribution of Clinostomum marginatum indicates that a wide range of conditions allow the adult to reach maturity.

2. The general form and appearance of the so-called adult worm as found in birds does not differ from those taken from the cysts of the perch.

3. The brownish bodies found in the liver of the snail and the minute cysts found in the muscles of the perch suggest that this represents part of the life history of Clinostomum marginatum.

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New York State Conservation Department

Walter Mulford

LECTURE No. 2

How to Insure to the People of New York An Abundance of Fish and Game

(The Commission will be glad to arrange for the illustrating of this lecture with stereopticon views, wherever possible.)

ALBANY, NEW YORK 1912

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STATE OF NEW YORK
CONSERVATION COMMISSION
ALBANY

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SYLLABUS OF LECTURE

1. INTRODUCTION.

   FEWER LAWS; MORE FISH AND GAME.

   A DELIGHTFUL AND HEALTHFUL *Recreation; Wholesome Food* FOR THE PEOPLE.

2. INDISPENSABLE CONDITIONS.

   MORE FISH AND GAME DEPENDENT UPON *Natural* AND *Artificial Conditions* IN A THICKLY SETTLED COUNTRY.
   Nature MUST HAVE *Man's Helping Hand.*

3. NATURE'S REQUIREMENTS.

   A. SUITABLE, ACCORDANT, COMPATIBLE HABITAT: COVERS, FORESTS, STREAMS.

   B. FORESTS IN CORRECT PROPORTIONS TO POPULATION, PROTECTED FROM FIRE AND OTHER DESTRUCTIVE AGENCIES.

   C. STREAMS CONTINUOUS IN FLOW, FREE FROM DELETERIOUS SUBSTANCES.

   D. GAME REFUGES; CLOSED STREAMS FOR SPAWNING FISH; PROTECTED SPAWNING BEDS.

   E. CONTROL OF FISH AND GAME DISEASES.

   F. ADEQUATE FOOD SUPPLY FOR GAME; HAY FOR DEER IN WINTER; ENCOURAGE INCREASED GROWTH OF PLANTS AND TREES WHICH FURNISH BERRIES, SEEDS AND NUTS FOR BIRDS AND ANIMALS.

   G. CONTROL OF THE NATURAL ENEMIES OF FISH AND GAME: DESTRUCTION OF RAPTORIAL BIRDS AND ANIMALS, OWLS, HAWKS, FOXES, WEASELS, ETC.; WAR ON THE SPAWN EATERS.

4. MAN'S HELPING HAND.

   A. ARTIFICIAL PROPAGATION OF DESIRABLE FISH AND GAME. (1) Suitable location of hatcheries and game farms. (2) Efficiency.

   B. INTELLIGENT DISTRIBUTION OF FISH AND GAME. (1) Species adapted to waters or covers. (2) Age of fish adapted to conditions. (3) Seasonable and timely distribution.

C. WISE, SENSIBLE AND PRACTICAL LAWS. (1) Uniform so far as climatic conditions will permit. (2) Codified. (3) Understandable. (4) Fair to all interests. (5) Practical.

D. PROTECTION — BY STRICT ENFORCEMENT OF LAWS AND FORCE OF PUBLIC OPINION. (1) Efficient Protectors. (2) Enlightened Public Sentiment. (3) Sufficient Number of Protectors.

E. FULL APPRECIATION BY THE COMMISSION OF POPULAR NEEDS AND DEMANDS; ACTIVE CO-OPERATION OF THE PUBLIC.

HOW TO INSURE TO THE PEOPLE OF NEW YORK AN ABUNDANCE ON FISH AND GAME

FEWER LAWS; MORE FISH AND GAME, DELIGHTFUL AND HEALTHFUL RECREATION, AND AN ABUNDANCE OF WHOLESOME FOOD FOR THE PEOPLE.

That is the chief concern of the Fish and Game Division of the Conservation Department. To bring about that much to be desired result the Department is taking unusual pains to inform itself of the conditions involved in the problem, as well as of the needs and requirements of a great and populous commonwealth like New York State. Let it be borne in mind that this object cannot be attained without the hearty and sustained co-operation of the people with the Department to which they have entrusted the conservation of the forests and streams and their wild inhabitants. Information as to fish and game conditions and requirements, as well as advice on the enactment and enforcement of laws, are respectfully solicited from the general public — sportsmen, nature lovers, farmers, landowners, professional men, workingmen. The State forests, the fish and the game, are theirs to have and to enjoy, and this great natural heritage can be made more useful, more enjoyable and more productive by a united effort of the people and their public servants.

CONFLICT OF INTERESTS UNDER OLD CONDITIONS

We are addressing ourselves on this occasion to the serious question of *How to Insure to the People of New York an Abundance of Fish and Game.* From the very nature of the premises—a populous commonwealth with a rapidly increasing population, confronted with a startling diminution of both its expendable and renewable natural resources, particularly the forests — the question is hedged about by the most perplexing obstacles and difficulties. Chief of these is the unfortunate conflict of interests under conditions which now obtain, but which must inevitably be found to be in complete accord under the sensible application of an old economic law: The Good of One is the Good of All; the Good of All is the Good of One. The welfare of the sportsman, and that of the landowner, two classes who have been in more or less conflict for ages, are interrelated in the modern understanding of the case. At least let us assume that, and see how the problem before us works out on that theory.

When people interested in fishing and hunting get together, the first impulse is to swap stories. Go away care, run along serious things, we have something pleasanter to engage us! The witchery of forest and stream, the warmth of morning sunshine, the grace of budding branches, the beauty of clustered blossoms, the music of the brook, the melody of birds steal upon us. Each one of us is impelled to confide to the others his own interpretation of the stories heard in the wildwood. We are apt to be impatient of practical men and practical affairs — as impatient as a certain editor was with his matter of fact and unsentimental compositor. The printer had found quoted in a rhapsodic article on the joys of living in God's Great Out-of-Doors the well known line: " Sermons in stones; books in running brooks." The faithful man of the types scratched his head and exclaimed, "Nonsense. The old man's twisted again. He meant, ' Sermons in books, stones in running brooks.' " And so it read in the paper next morning.

However, let us curb sentiment for the nonce. Let us shut out the picture of waving branches and sparkling waves, and the delightful themes they invite, and get down to brass tacks.

MORE FISH AND GAME

Let us at once confront the indispensible conditions of insuring for present and future generations an abundance of fish and game; more recreation in forest, field and stream, more hunting and fishing.

Our forefathers upon their arrival in New York found fish and game in almost endless variety and in an abundance which seemed to preclude the wildest dream of serious diminution. It occurred to few if any of the hunters and fishermen of those days that there was any necessity to curb waste, even in consideration for the generations unborn. Nature cared for the fish and game supply of the present with a lavishness that made the destruction of certain kinds of game indispensible to agricultural success. For many years natural conditions sufficed.

Today a sufficiency, or at least a fair supply, of fish and game is DEPENDENT UPON ARTIFICIAL AND NATURAL CONDITIONS. NATURE MUST HAVE MAN'S HELPING HAND. That helping hand the Conservation Commission is extending, but the people and the Legislature must both fill and sustain it, if the people are to have MORE FISH AND GAME.

In this structure of More Fish and Game which the people of New York are erecting with loyal, earnest and generous hands, we must of course look to nature for the foundation. Depleted may

THE CABIN HOME.

DEER HUNTERS' CAMP.

be our forests, diminished our streams, in a State once a natural terrestrial paradise, more beautiful and alluring than the Hesperides or the Islands of Atlantis around which the ancients weaved fantasies of unending bliss; yet the Empire State is far from a barren waste even in the eyes of the most exacting disciple of the rod and gun, or of the most critical lover of the beauties of nature. To confirm that statement we need but marshal before our eyes all the beauties, ecstacies and inspirations which the Niagara, the Hudson, the Racquette, the St. Regis, the Delaware, the Susquehanna, the Mohawk, the St. Lawrence summon; all the sublimities and grandeurs which the Adirondacks, Catskills, Helderbergs and Palisades command; all the graces and allurements of a hundred lakes and little rivers, of a thousand smiling valleys, and of almost unnumbered places of storied or unsung loveliness.

SPORTSMAN'S PARADISE POSSIBLE

With nature assisted intelligently and scientifically, only in keeping with the progress of other arts and sciences, fish and game culture and protection can make New York a sportsman's paradise.

NATURE'S REQUIREMENTS are therefore to be considered in logical order, under these subdivisions:

A. Suitable, Accordant, Compatible Habitat — Covers, Forests, Streams.

B. Forests in Correct Proportion to Population, Protected from Fire and other Inimical and Destructive Agencies.

C. Streams Continuous in Flow, Free from Noxious Pollution.

D. Game Refuges; Closed Streams and Protected Spawning Beds Set Apart for Breeding Fish.

E. Control of Fish and Game Diseases.

F. Adequate Food Supply for Game; Hay for Deer in Winter; Encourage Increased Growth of Plants and Trees which Furnish Berries, Seeds and Nuts for Birds and Animals.

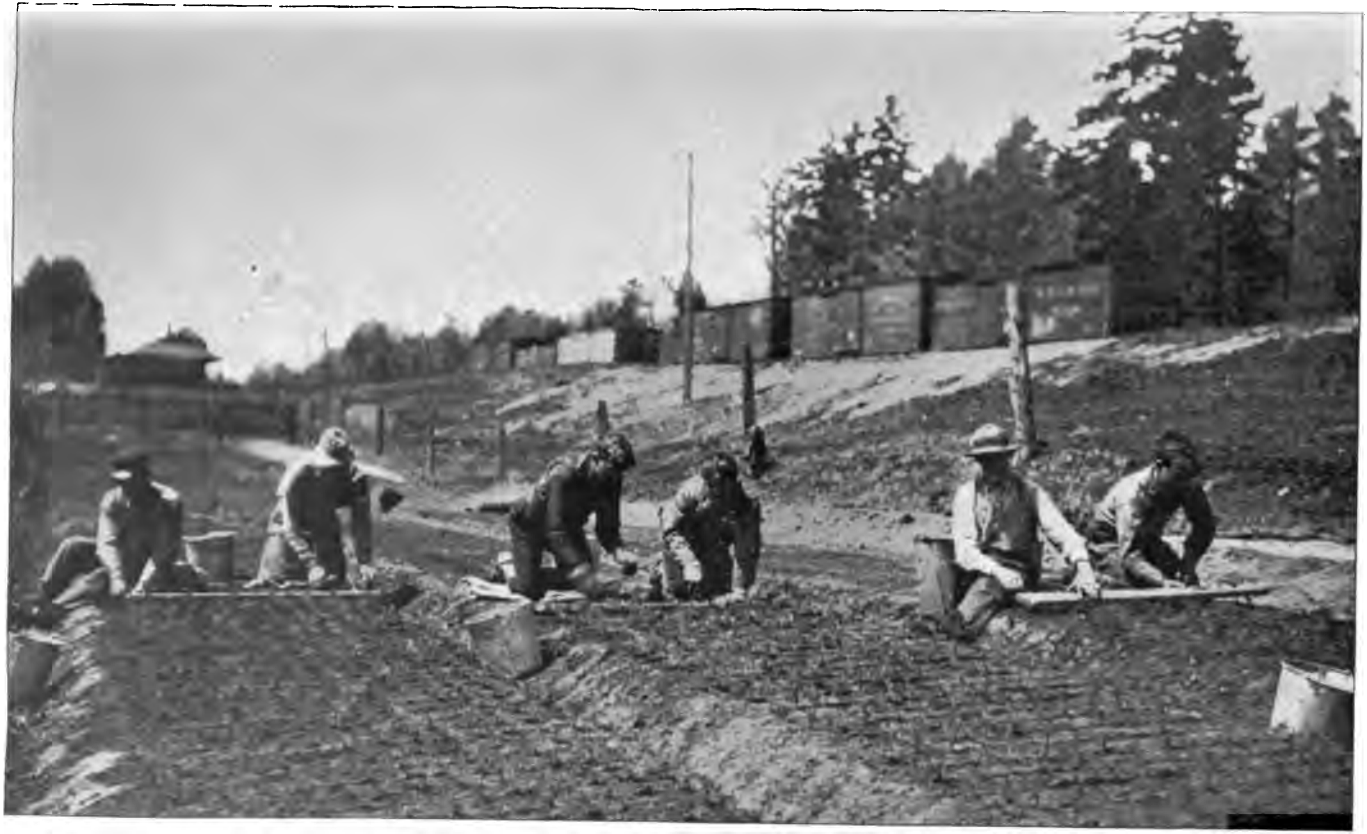
G. Control of the Natural Enemies of Fish and Game; Destruction of Raptorial Birds and Animals — Owls, Hawks, Foxes, Weasles, etc.; Wage War on The Spawn Eaters.

TO WIDEN HABITATIONS OF FISH AND GAME

Under the broad and progressive policy of the Conservation Commission the suitable and compatible habitations for both fish and game are being enlarged as well as improved. This could be dwelt upon more in detail in a lecture on the operations of the Division of Lands and Forests. But in a word, it may be said that New York is taking the lead of its sister states in the work of reforestation; the common welfare is not concerned whether the new trees be planted by the State on public lands or by private enterprise on private lands in the State; the Department is reforesting thousands of acres of State lands and last year furnished nearly two million trees to private land owners at cost; by the establishment of new nurseries and installing improved methods, together with the employment of prisoners, trees will be supplied to landowners for reforestation at an astonishingly low rate; eleven million trees are on hand for sale by the State this year; today in this State, despite New York's great reforestation progress, but one tree is planted to every five cut down; within three years, at the present rate of gain in reforestation work THERE WILL BE PLANTED IN NEW YORK AT LEAST ONE TREE FOR EVERY ONE CUT DOWN. But, it is the policy of the Commission not to content itself with having the forest areas merely hold their own, but to see to it THAT THE FOREST TRACTS SHALL BE ENLARGED TO A POINT REQUIRED BY THE PUBLIC WELFARE WITH REFERENCE TO A CONTINUOUS AND SUFFICIENT WATER SUPPLY, AS WELL AS TO COMMODIOUS RESORTS FOR SEEKERS AFTER HEALTH AND RECREATION, AND AMPLE HABITATIONS FOR BIRDS AND BEASTS WHICH THE HUNTERS SEEK.

WATER STORAGE NECESSARY

In like manner, the division of inland waters could inform us in detail of wise and economic plans for the conservation of the waters of the State, of interest not only to the angler, but to the sanitationist, nature lover, manufacturer, and last but not least, to the practical student of domestic economy who so much feels the need of cheaper light and heat. But just now we are addressing the angler. He knows the effects of the watershed denuded of its forests upon his favorite trout stream. With anxiety he witnesses the spring freshet sweep down its mighty flood in the spring time, well foreseeing that man's interference with the conservation arrangements of nature but presages the opposite extreme of an unnatural inundation — the dry creek bed in mid-summer. Gone are the trout in the haunts where the speckled beauty used to lie in wait to do battle with the knight of rod and reel, for *Salmo fontinalis* cannot endure anything but a permanent home.



C. R. Pettis, Photo.

TRANSPLANTING SEEDLINGS, SARANAC NURSERY.

9

PROTECTING THE FORESTS

While looking to the permanence of the habitations of trout, bass, muscallonge, perch and pike, and of the deer, partridge, squirrel, rabbit, woodcock, snipe and duck, and striving for the possible enlargement of their natural abodes, the Conservation Commission is also actively engaged in protecting and improving the homes of the wild creatures. In the forests, watchmen are now located on all the important mountain peaks on the look out for fires, the arch enemy of the woods. Fire protection regulations have been improved and the State system, which patrols and guards over 4,000,000 acres of private forest lands, in addition to its own 1,600,000 acres, reduced the loss by fire last year to an almost inconsiderable amount. This is a matter of congratulation to the people of New York State, for the State Preserves are their own natural health resort and playground, and under a properly liberalized policy of State regulation they should and will come into a fuller and more general enjoyment of their own. The effects of the forestry protector's splendid work last year, in a period of almost unprecedented drought, are a subject for the heartiest felicitation and thanksgiving in the light of a hundred staggering forest fires, which darkened the neighboring state of Massachusetts with a million dollar forest loss, and swept millions of valuable timber in the Lake Region and the far west into the great ashpit which is always smouldering close to the doorsteps of shiftlessness and improvidence.

Again the Inland Waters Division may be invited to step forward and tell what is planned to stop the unconscionable pollution of rivers, lakes and streams, once teeming with food and game fish for the people, which is committed the year round by municipal and industrial sewage and waste. Communities must everywhere stop the mediaeval practice of dumping their filth into the nearest water, or a black death, fouler and blacker than the scourge which devastated the towns of the Dark Ages, will sweep the growing millions from the face of our fair country. Is it not astounding that this practice continues in the light of intelligence and accepted truths of sanitation! Public health is paramount, but of no inconsiderable influence is the voice of the angler demanding his right to the enjoyment of streams and crying out in protest against corporate greed or municipal indifference which have combined to rob him of the joys which his boyhood knew. The people of the stuffy office, the grimy mill, the hot harvest field, long for the quiet and restful hours which they once enjoyed beside the pellucid brook, and the material triumph attending the return home with a " big string." That brook is now little better than an open sewer or a disposal canal. For the masses there are no expensive outings to the wilds of Canada or the remote recesses of the Adirondacks or Catskills where there is fishing attended by catching. Every little hamlet has its nearby brook, creek, river, pond, or lake. Many a little hamlet today has little nearby fishing.

POLLUTION OF STREAMS INDEFENSIBLE

The blame lies at the doors of the common American system of waste disposal adopted by both municipalities and manufacturing concerns — a practice which is both contrary to ethics and in violation of well established principles of economy; for, it deprives the people of their inalienable right to the pursuit of happiness, and, it robs the land of the elements of renewal embodied in waste substance which should be returned to the soil.

Pure water, fellow sportsmen, is not only pure logic, but it is pure right.

The protection of forests and streams means far more to the cause of more fish and game than protection of fish and game by statute and law enforcement. It means something to protect in places where the rapacity and unwisdom of man has created a solitude so far as the wild creatures of the earth are concerned.

GAME REFUGES AND PROTECTED SPAWNING BEDS may seem to fall more properly under the head of "Artificial conditions," but it is preferable to deal with this feature of fish and game increase under the first division of our subject, because if given a chance nature will take care of her little children of the fin, fur and feather tribes. In the undisturbed state of nature there were breeding refuges for the wild creatures in every valley and on every mountain side. Every brook, river and lake had its spawning places uncontaminated by mill waste or town sewage. In the State of New York today conditions are entirely different.

There is undoubtedly much to be said in favor of the posted farm law, especially if it be applied in a liberal spirit. Posted farms have furnished game refuges, breeding places for birds and animals, and it is a matter of satisfactory record that good shooting has been enjoyed in many sections of the State where it had not been found for years. The sport, too, has not been confined to the land owners, either, for the natural " overflow " of game has benefited the unposted lands. The farmers and the sportsmen can get together on this matter. The man who has not a friend or two in the country who are willing to give him the privilege of a little shooting each season

HIS FIRST DAY A-FIELD.

THE LAST LOAD.

is quite apt to be a fellow who is a habitual violater of the law and not entitled to carry a gun.

A WESTERN NEW YORK EXAMPLE

In a certain western New York county the land owners got together and posted a four-mile strip along a creek. This area was within three miles of a city. For years the country for miles around had been scoured by aliens who shot every wild thing in sight, from a sparrow and robin to a squirrel or pheasant, unmindful of law or season. The result was that game of all kinds was practically exterminated and wild birds of all kinds were scarce. The posting experiment was tried for three years. Today pheasants are to be found in every cover; gray and black squirrels have returned in small numbers and even the ruffed grouse is wandering back to his favorite haunts in the thickets along the stream. Three years ago it would have been difficult to note the presence of a dozen different species of wild birds in a single season, but now they have returned by scores of varieties and are nesting in their old homes, undisturbed by the sound of a gun during the breeding season. The landowners permit all members of sportsmen's associations and others, who are active friends of law enforcement and the game increase movement, to hunt during restricted periods in the open season, and with satisfactory results to all concerned. The unposted territory all around has felt the beneficial effects from this game refuge, and good shooting has been obtained by the general public in that entire county. Pheasants had been distributed in the county some eight or ten years ago, but that splendid game bird, the wild turkey's successor in New York, did not become plentiful until the posted farms began to dot the landscape. Some of the most violent opponents of the posted farm law have become its warmest friends.

STATE GAME REFUGES

However, should the posted farm become the rule, and the unposted lands the few and far between exceptions, in the interest of affording sport for all who desire recreation with the gun, it will doubtless become necessary to supplement the posted farm law, or modify it. A suggestion of apparent merit is that the State lease suitable tracts of lands in each county to be used as game refuges and breeding grounds for animals and birds. The right to prohibit shooting the year round on certain designated farms could be obtained at almost nominal sums. Under existing conditions most farmers secure little benefit from hunting on their premises, and in too many cases they suffer from the depredations of irresponsible and unsportsmanlike hunters, both with respect to their crops and fences and also their live stock.

The policy of the Commission is to pay more attention to the rights and interests of the farmer relative to fish and game than heretofore. This can be done and at the same time promote the welfare of the good sportsman, because the interests of landowner and hunter are from the very nature of things most intimately related.

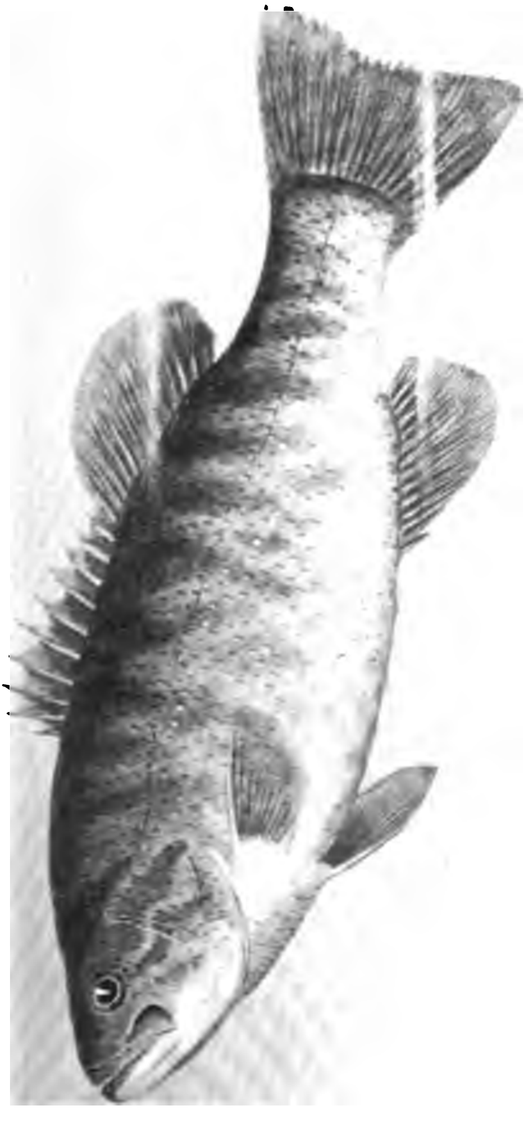
Nature's game farms in every county in the State would tend to decrease the number of inmates at the county poor farms.

Undoubtedly a similar policy could be profitably adopted with reference to establishing closed streams in various localities where spawning fish would be undisturbed. If it could be effectively accomplished, and there seem to be few obstacles to the plan, natural spawning beds of game fish in Lake Erie, Lake Ontario and some of the inland lakes should be staked off and protected the year round. The pollution of streams flowing into large rivers and lakes, which had been almost the only breeding places for game fish under natural conditions, has deprived a very large percentage of the finny inhabitants of spawning grounds.

Game Refuges and Protected Spawning streams and beds would materially decrease the strain on the State Game Farm and State Hatcheries.

CONTROL OF DISEASES

The CONTROL OF FISH AND GAME DISEASES is also another matter of the greatest importance. This, too, might be considered under the Artificial Conditions head, but since in a large measure artificial conditions imposed by man in the contamination of waters inhabited by fish are responsible for fish ailments, control of these diseases comprises an effort to restore natural conditions beneficent to fish life. Dr. Tarelton H. Bean, State Fish Culturist, has been eminently successful in the treatment of various fish diseases and many of his methods have been adopted by fish culturists of other states. The diseases of game birds and animals are coming in for careful attention. Specialists believe thay have correctly diagnosed the infection which caused such lamentable havoc among the ruffed grouse some seasons ago and it is hoped that some practical preventive can be applied.



Sportsmen and landowners will do well to co-operate with the Department in working out the solution of the problem of insuring a more plentiful food supply for game birds and animals in the State. The experiment of feeding deer in the winter has proved encouragingly successful and it will be extended so as to eventually reduce the loss by starvation among the deer to a very low rate. With the destruction of woodlands, coppices and forests, food for the various kinds of game has grown less plentiful. Various seed and berry growing plants and shrubs can be started in localities from which they have disappeared; nut trees of various kinds should be planted in regions where they are no longer numerous. The Forestry bureau will be glad to furnish sportsmen and farmers with information and instructions on this important subject.

CONTROL OF NATURAL ENEMIES

The CONTROL OF THE NATURAL ENEMIES OF FISH AND GAME ranks as one of the most important phases of the work in which we are all interested. The uncontrolled hunter can do a great deal of damage by shooting in season and out of season, taking toll in accordance with his opportunity and ability to kill, and without respect to law or common sense. But, the raptorial birds and animals which prey on game and fish are busy day and night. Their existence is dependent upon their untiring activity in capturing the partridge, the quail, the trout or the bass. These natural enemies need no enumeration to sportsmen, because they are only too well acquainted with the ravages of the foxes, hawks, weasels, owls and other night and day raiders in forest and stream.

Sportsmen and landowners will find it to their interests to conduct an unceasing and systematic warfare upon the natural enemies of fish and game.

MAN'S HELPING HAND

MAN'S HELPING HAND, the improvement of natural conditions by artificial means, now comes in for careful consideration. The following subdivisions readily suggest themselves to all students of this subject:

A. ARTIFICIAL PROPAGATION OF DESIRABLE FISH AND GAME. (1) Suitable location of hatcheries and game farms. (2) Efficiency in propagation.

B. INTELLIGENT DISTRIBUTION OF FISH AND GAME. (1) Species adapted to waters or covers. (2) Age of fish adapted to conditions. (3) Seasonable and timely distribution.

C. Wise, Sensible and Practical Laws. (1) Uniform so far as climatic conditions will permit. (2) Codified. (3) Understandable. (4) Fair to all interests. (5) Practical.

D. Protection — By Strict Enforcement of Laws, and the Force of Public Opinion. (1) Efficient protectors. (2) Sufficient number of protectors. (3) Enlightened public opinion.

E. Full Appreciation By the Commission of Popular Needs and Requirements; Active Co-operation of the Public.

It has been well said, and often repeated, that " It is not all of fishing to catch fish." True, for it sometimes involves catching a cold, but nothing more. Yet, the hardships, the lack of success, as relates to the creel or the bag, and even the gibes of friends, can detract very little from the ineffable joys of forest and stream. The rule is, as a matter of fact, at least in the case of the genuine sportsmen, that these minus signs really add to the sum total of enjoyment. And, we cannot let the analyzation of the proposition, "It is not all of fishing to catch fish," stop there, for the joys of the outing are not of the present alone, but extend into the future and are cumulative: the sportsman goes home and talks over with brother sportsmen the success in catching and the failure to catch.

" Then talk no more of future gloom —
Our joys shall always last;
For Hope shall brighten days to come,
And Memory gild the past."

THE ZEST OF ANGLING

Sportsmen who have been fortunate enough to journey into the remote wilds confess that there is such a thing as the fish and game coming too fast. Undoubtedly there is an added zest in the sport when one has to work hard for every trout or bass, for every bird in bag. The usual conditions in this State furnish that zest. Accordingly we sportsmen should all be glad to *work* for more fish and game. In the main we need not be afraid of making it too plentiful. At any rate let us go ahead until the general public agrees that there is enough for all. Give everybody a chance to obtain occasionally a full creel and a good bag.

The ARTIFICIAL PROPAGATION OF FISH has made phenomenal progress in New York. Last year the State hatcheries distributed over seven hundred million fish. New York's nine hatcheries produced almost one-fourth as many fish as the Federal Government's fifty hatcheries. New York propagated twice as

A FAIR ANGLER.

SPORTSMAN AND GUIDE.—A FRIENDLY CHAT.

THOUSAND ISLANDS, ST. LAWRENCE RIVER.—A MASKALONGE HOOKED AND COMING TO GAFF.

many fingerlings and yearlings as the U. S. Fisheries Bureau. In the case of some species best results are obtained by handling the fish to be distributed in the earliest stages, but in the case of trout, for example, the advanced stages are best. Last year showed an increase in artificial propagation of 165,000,000 fish and this year at least one billion fish will be sent out to all sections of the State. Upon a basis of one-half the prices charged by private hatcheries, the State hatcheries production in 1911 was worth over $200,000 and cost only about $75,000.

LOCATION OF HATCHERIES

The LOCATION OF HATCHERIES with reference to the needs of the waters of the State is given more scientific and practical attention. It is planned to establish a new hatchery in St. Lawrence county so that the requirements for the restocking of the splendid brooks, lakes and rivers of that renowned region may be more economically and effectively met.

The inventoried value of the present nine hatcheries, located at Upper Saranac, Bath, Mumford, Bemus Point, Cold Spring Harbor, Margaretville, Old Forge, Linlithgo and Constantia totals $144,251.77. It is proposed to make the St. Lawrence hatchery the best in the United States.

The Commission is now propagating upwards of thirty species of fish and other aquatic animals. The vast majority of the fishes planted are marine, such as smelt, tomcod, flatfish, sea bass, edible crabs and lobsters. In the freshwaters the pikeperch, muscallonge, black bass, whitefish, lake herring, trout and yellow perch are receiving the most attention. The shad and river herring are taken in the Hudson river and many millions of the young fish, besides many thousands of fingerling shad are annually returned to the river from which the eggs were obtained.

A systematic survey of State waters with reference to their fishery resources is greatly to be desired.

The waters of the State contain very important developed and undeveloped resources in the fish and other aquatic animals which inhabit them. Few states can compare favorably with the number of inland lakes and streams, the costal areas in both fresh water and salt water, and in the number of species of economic value found within the borders of New York. It is stated that we have more than 1,400 named lakes. The drainage systems of the State include the Great Lakes, Lake Champlain, the St. Lawrence, the Ohio Basin, the Susquehanna, the Delaware, the Hudson and many adjacent small streams.

ABUNDANCE OF FISH FOOD

Long Island alone has 244 species of fish, chiefly marine, while the entire State possesses nearly 400 kinds. From an economic standpoint the marine fisheries are far more valuable than any others. These include the oysters, the most valuable of all, clams and other shellfish, lobsters and other crustaceans. The State fisheries, both fresh water and marine, are capable of vastly greater development, which would result in affording to the public a larger supply of needed wholesome food, reducing the cost of living, and should also yield a greater revenue to the public treasury. A proper adjustment of the shellfish rentals would make the Fish and Game Division self-supporting even on larger proportions of outlay than at present.

The State Game Farm at Sherburne Falls distributed last year 2,535 pheasants and 12,945 pheasants' eggs. This year the brood birds will be increased from 400 to 1,000, and the output of young pheasants and eggs for general distribution will be more than twice that of last year.

An effort will be made to propagate the ruffed grouse on the game farm and thus restore to covers, which have not rustled with wings for years, the hunter's favorite game bird, the partridge.

Experiments are to be made on various desirable foreign game birds. The efforts to restore the bobwhite to his old haunts will be redoubled, although little in that direction can reasonably be expected without an extensive restoration of covers.

THE "MORE GAME" MOVEMENT

The more game movement would be lent practical aid by the establishment of game farms in various sections of the State, so that scientific propagation and distribution would be readily adaptable to the climatic conditions and local requirements of the different regions.

Sportsmen hail with delight the presentation, through the revision and consolidation of the fish and game laws with which the Conservation Commission is charged by law, more compact, comprehensible, uniform and sensible laws.

The utility and effectiveness of the Bayne law prohibiting the sale of game (with certain exceptions), with reference to the increase of game, is now on trial. The sportsmen, farmers and all lovers of recreation in forest, field and stream, show a proper disposition to co-operate with the Commission in making the test an instructive and useful one. The general experience of the protectors is that the anti-sale law is very helpful to the service, and in itself is a valuable protection to the wild game of the State. Through the operation of this law the pot-hunter has lost his market, and hence the incentive to take more game than he himself can use. The cold storage law and the Sullivan law also come in for similar commendation.

The proposed new laws aim to deal fairly by all interests.

Game laws cannot be effectively enforced unless thay appeal to the common sense and the common interests of the sportsmen, the farmers, the land owners and others whom the statutes directly affect.

TO POPULARIZE LAW ENFORCEMENT

The Fish and Game Departments of the several states have heretofore rated their efficiency on the number of convictions secured and penalties recovered, with the greater the number of successful prosecutions the greater the credit claimed by the protectors. The New York State Conservation Commission will endeavor to popularize the work of preserving and protecting the will life of forests and streams to a point where the old-time standard shall be reversed. By that, of course, is not meant that there shall be any relaxation of vigilence and determination to bring habitual and willful violators of the law to justice. Until public co-operation in the enforcement of the law shall have become more general and active, the efficiency of protectors must to a large extent be based on the number of convictions secured. Until that time the hands of the Protective Department should be strengthened in this State. An increased number of protectors is urgently required. There should be at least one in every county, and several protectors in each of the counties where, from natural conditions, the largest number of violations occur.

Throughout the State there is apparent a more general desire on the part of the public to assist the Department in the enforcement of the fish and game laws, indicating an aroused popular sentiment in favor of the object of these laws.

During the year the regular and special protectors brought actions which resulted in the recovery of $30,937 in fines, at an expense of $4,700 cost of prosecutions; 1,298 fines were imposed, sentence was suspended in 71 cases; 23 violators were sent to jail; 41 were acquitted; 21 cases were discontinued; one jury disagreed.

SOME PROPOSED GAME LAW CHANGES

Among the more radical changes proposed in the game laws this year are: A change in the size limit of trout from six to seven inches; a bag limit of 25 birds per day on wild fowl; a bag limit of

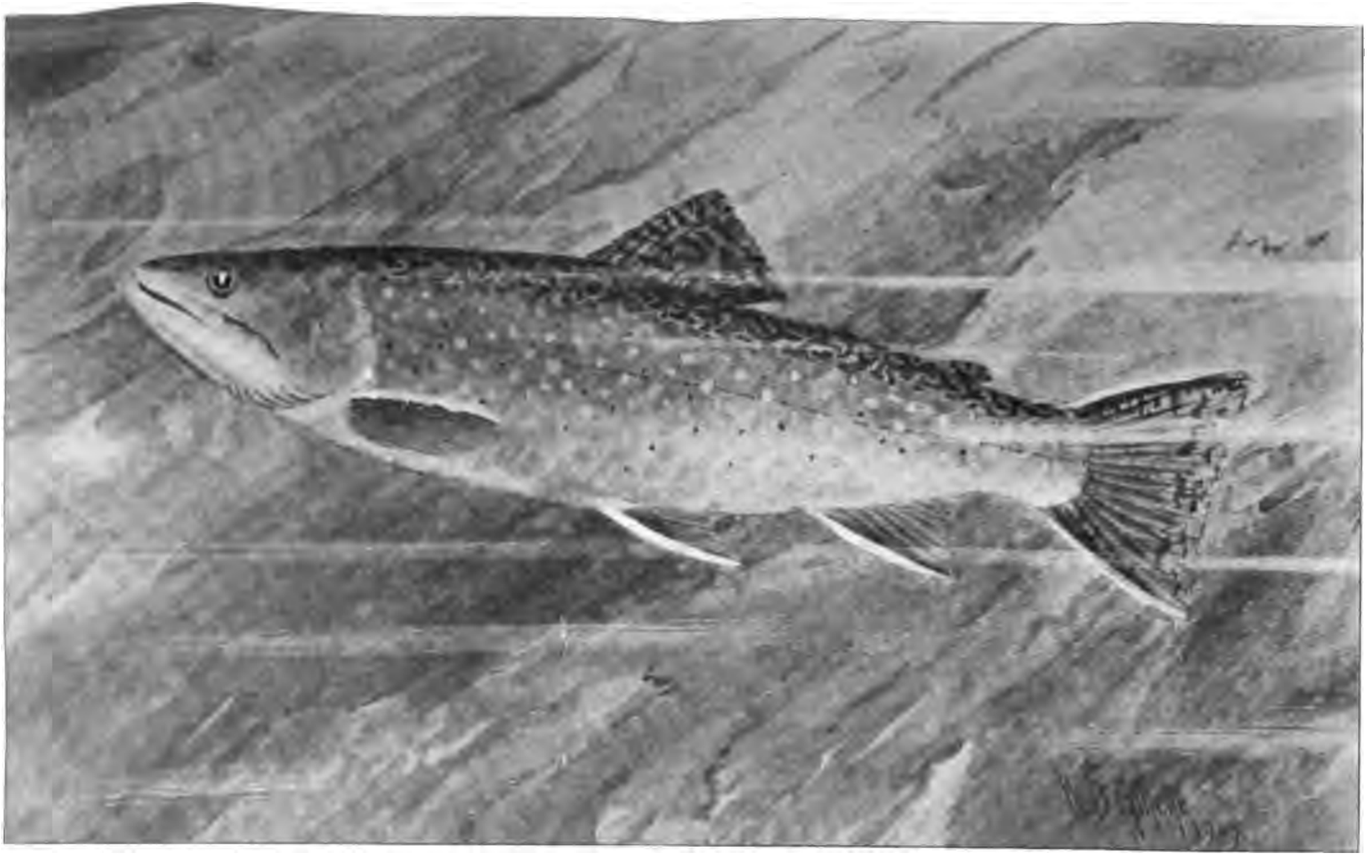
15 birds per day on shore birds; the authorization of the sale of hatchery raised trout; deer limited to two bucks; granting a citizen permission to bring into the State under certain restrictions game lawfully taken in another state or country; a trapper's license; bag limit of 5 per day on squirrels.

The so-called plumage law, attacked by the plumage interests as unconstitutional on the chief ground that the Legislature had no right to classify birds into families, was upheld by the Federal Circuit Court in New York, and the New York Attorney-General's interpretation of this wise law for the protection of our wild birds was approved.

" FEWER LAWS; MORE GAME." With that popular slogan the Conservation Commission is in hearty accord. On its own part, the Commission is earnestly and systematically striving to attain to a fuller appreciation and realization of the popular needs and demands with reference to fish and game. It may therefore ask, with every assurance of a hearty response everywhere, for more active assistance and co-operation on the part of the people throughout the State.

" FEWER LAWS; MORE FISH AND GAME."

That calls for FEWER KNOCKERS AND MORE SUPPORTERS OF WISE GAME LAWS ENACTED FOR THE BENEFIT OF ALL THE PEOPLE.



MALE BROOK TROUT.

(*Salvelinus fontinalis Mitch.*)

Walter Mulford

GAME PROTECTION.

During the latter part of 1894, a party of gentlemen met in the city of Harrisburg, Pa., for the purpose of considering the question of protection to game, and to the insectiverous and song birds of our State. They came from the east and from the west, from the north and from the south, at the instance of two men living in said city, and for the sole purpose of devising some plan whereby these innocent and helpless children of the field and of the forest should be saved from absolute extinction.

As the result of this meeting, the Game Commission of the State was created by act of Assembly, June 25, 1895, and it was made their duty to see to it that the laws on the statute books, and those that might thereafter be enacted upon this subject, should be enforced.

After repeated meetings between the gentlemen who originated the idea of a Game Commission, in connection with a committee from said Commission and other parties invited to assist in the matter, the act which afterward became the game law of 1897, was formulated. There was no thought of self interest entering into the consideration of this subject; there was no hope on the part of any one of them of a return for either time or money expended in the matter, their sole object was to save from destruction the game birds, the game mammals, the song and the insectiverous birds of our State. They were men from all walks of life from the Judge on the bench to the ordinary day laborer, but every one deeply interested in the subject, and willing to contribute of his means to its success, some of them were experts with the gun, able to kill at almost every shot, some never put a gun to their shoulder, but purchased what game they got, some were from the extreme northern part of the State where the game bird grew strong and quick of wing, early in the season, some were from the southern tier of counties, where, because of warmer surroundings, the Quail for instance, hatched twice in the season and the last hatching was not fit to shoot before the middle of December, and often not then. Their ideas and interests were not the same except upon the question of protection badly needed, and in that interest they soon came to a conclusion, deciding, in the first place, to make the shooting season uniform, thus keeping the irresponsible gunner out of the woods and fields as much as possible, and to limit the time of legal shooting to two months. In proof of the assertion that there was no self interest in the matter, the men from the northern tier of counties said "We in our section ought to be allowed to shoot squirrel on the first of September, but if this is allowed we know that other game will be killed by gunners who, under the name of squirrel hunters, would traverse the woods from that time until the close of the season and kill anything that came in their way; we will therefore agree that the season shall open on the 15th of October." The men from the south said "In the same interest we will agree to come forward to that time, although for genuine sport, we should not begin shooting before the 1st of December, and in some sections not even then." The expert said, "While I am able to kill to many score if given the opportunity, I will agree to be limited in the number of each kind of game bird or game mammal I may kill, and make that number reasonable." The man who never shoots said, "I will agree to buy no game of the kinds that at present need protection most," and so the law of 1897 was drawn. The majority of these men were members of what is known as "The Pennsylvania State Sportsmens' Association." The second section of whose declaration of principles reads as follows: "The preservation of our forests; the protection and propagation of song and insectiverous birds, game birds, game mammals and game fish; for the aiding in the enforcement of the laws of the Commonwealth governing the same; for the promotion of kindly intercourse and generous emulation among sportsmen; to unite the efforts and influence of all law abiding citizens within the State in securing such legislation for the future preservation of our game birds, game mammals and game fish, as will be best suited to the interests of the people of our Commonwealth at large." An organization of representative men of the State interested from pure motives in saving and increasing our growing timber and our shade trees, thus preserving and securing to those who shall follow us, among other things the beautiful landscape we all enjoy, the source of a continued and pure water supply, the pleasant and shady retreat on a hot summer day, God's natural temple and the city of refuge to those whose only hope or defense has been flight to her protecting arms.

"To him, who in the love of nature, holds communion with her visible forms, she speaks a various language."

Last fall, driven before the north wind, like a wisp of straw, a fluffy little ball of yellow, red and brown feathers in the shape of a robin was whirled through the orchard and across the meadow, on the road to his home in the south, like a shadow he was gone and the lesson was "Thus passeth human life," or at least our opportunities, and "the winter has come."

All over this grand State of ours, this condition is recognized by every one interested in the subject; the winter has indeed come to the birds, and unless those who love them rise in their full power, and right speedily at that, it will be too late. Not only is this condition recognized by the Pennsylvania State Sportsmen, but by the Pennsylvania Audubon Society and other societies. The Audubon Society is an organization of ladies and gentlemen, leagued together for the purpose of protection to our birds, and like the members of the State Sportsmens' Association, they also are willing to surrender some of their personal pleasures and say: "We hereby agree not to purchase or use the feathers of wild birds for ornamentation and will do what we can to encourage the protection of our native birds." The originators of this organization must surely have been country born, or at least, spent many an hour in worship at nature's shrine in communion with birds and flowers, and able to recognize the voice of each; for, "There is one glory of the sun, and another glory of the moon, and another glory of the stars; for one star differeth from another star in glory." And the lesson is, the winter is passing, is almost gone, the snow is not all melted from the fence corners where the heavy drifts lodged, but the sun is shining, and on the topmost branch of that tall locust tree in the lane, sits a messenger pouring out his song of promise and of hope, it's the same old robin and he is singing the self same song his people have sung, since Time's morning, by it we know that nature is about to show us a mystery to work out another miracle, and that perhaps even tomorrow, the blue bird will be twittering on the gate post and the cluster of lilies of the valley on the south side be unfolding again that beauty of raiment, that bothered old Solomon to equal.

Will you not enlist from the pure love of nature and give a little of your time to establishing a like condition for the birds, making their hope unfold into the reality of an endless summer for them, with its mating time its peace and its rest. Will you not contribute a little of your time to securing protection to the things that go so far toward making nature beautiful.

Scientific research has determined the fact that growing timber, forests and shade trees, are absolutely necessary to the healthful enjoyment of this life, and a noted scientist recently expressed the opinion that "this world of ours would not be inhabitable by man in fifty years after its bird life was taken from it."

In round numbers we have in the United States to-day over 5,000,000 farms with an acreage of fully 700,000,000. The labor of the farmer and the fruit grower is repaid by products to the value of more than $3,000,000,000 annually, it is claimed that the return to the agriculturist is reduced by insects and rodents fully one-tenth of this amount or in round numbers $300,000,000 worth of farm products are destroyed and lost to the farmers each year. All this even with the help of the birds as protectors, what would it be without their help? Calculation shows that an increase of but one per cent. on the value of the farm products of the United States annually will more than equal the combined money value of lace and millinery industries of the nation for the same time, reports from ornithologests prove beyond the shadow of a doubt, that every bird named in the act of 1897 is actually worth its weight in gold to the farmer. In round numbers Pennsylvania contains 45,000 square miles, 640 acres to the mile gives us 28,800,000 acres in the State, say there is but a single bird to the acre, and allow that bird but thirty bugs or insects each day, and you have the birds of the State destroying 864,000,000 injurious forms of life beside the eggs of the same, allow 200,000 of these forms to the bushel and you need 4,320 bushel each day to feed the birds of our State alone. So that it can be easily understood why this world would not be inhabitable in a few years were the birds taken from us, let me impress upon the farmer the value of each bird to him. From the standpoint of dollars and cents, are they not worth the cost of protection, is the laborer not worthy of his hire

Not only should they be protected from destruction at the hands of man, but also from the vicious of their own kind, from the owl, the hawk, and the crow, for while it is admitted that these three last named birds do some good in the way of destruction to rodents and insects, the evil they do more than out weighs the good, and the weight of opinion tends to their destruction. A noted ornithologist says on this subject "No observing person will deny that the crow does serious damage to the eggs and young of wild birds. The instances of such depredations which have come within the knowledge of most farmers and others living in the country, are far too numerous to leave a shadow of a doubt on this score in any unprejudiced mind, yet for every instance of such robbery witnessed by man, thousands must take place without his knowledge. Persecution by crows is doubtless a very large factor among the influences which cause so many birds to crowd around human habitations during the nesting season, and yet the relentless crow follows them even to the eaves and window sills of our houses, taking their eggs and young in spite of every precaution, and the only wonder is that the wild birds of many species are able to raise young at all." The sharp shinned hawk, Coopers hawk, goshawk, duck hawk, pigeon hawk and hen hawk, with the great horned owl and the barred owl are great destroyers of birds and game.

The red or pine squirrel is also one of the greatest enemies that song and insectiverous birds have to contend with, they destroy not only the eggs and young birds in the nest, but full grown birds as well.

Will you not enlist then among the army of protectors to our forests and our birds from the stand point of self interest, if nothing else.

The Pennsylvania State Sportsmens' Association has given you good laws. They say "there shall be no hunting or shooting on Sunday." They say "That song and insectiverous birds shall not be killed at any time, or for any purpose, except in the interest of science, and then only under a certificate issued by the Game Commission." They say "That game birds shall be killed during but a limited period and then only in restricted numbers," and in doing this they say to the farmer we are your friend too, we are trying to save to you the help of all these legions of the air, we have limited the time during which you will have to contend with the irresponsible person who under the name of hunters, open your gates, tear down your fences, shoot your stock and your poultry, and so frequently start forest fires that result in great injury to you and to the State at large. They have given you the act of 1899 which makes constables game, fish and fire wardens and imposes a penalty upon them when they refuse or neglect to do their duty, after their attention has been called to the matter in a way prescribed by said act.

They have given you the Game Commission who stand ready to do all in their power to enforce the laws as they exist, and to prevent vicious legislation on this subject in the future.

And last but not least, God has given you the help of a great band of noble souls in the Aubudon Societies who without the hope of reward from a financial standpoint, are spending their time and their money for the protection of your best friends.

When the farmer, the farmer's wife, his sons and his daughters take hold of this matter as they can and should do, and are willing to prosecute or furnish the evidence for the prosecution of offenses coming under their notice. When the professed Christians of this land are willing to do their duty as they can and should do in this matter, and not "pass by upon the other side," then indeed will the summer be at hand, and we can say "The winter is over and gone; the time of the singing of birds is come and the voice of the turtle is heard in the land."

Those owning property can control it as they please within the law, in the matter of game they can say, there shall be no shooting, or they can grant shooting privileges as they please. By an organization of the farmers of your neighborhood, lawless shooters can be punished or controlled much more readily than where single individuals attempt the correction. The members of the Pennsylvania State Sportsmens' Association and other shooting men of the State have time and again raised funds and purchased quail for restocking the State, when, because of the unceasing and relentless murder by market hunters and the ravages of severe winters they had become almost extinct, they are now trying to preserve them and ask that you lend a helping hand in that direction. The simple fact that an organization for this purpose is known to exist in your section, will prevent much wrong doing, the game bird, the song and the insectiverous bird will be protected as never before, and your crops correspondingly increased.

The organization of any society for the protection of our birds and our forests can only result in good to you and to the State, and this office will upon application gladly furnish any information in its power that will assist in that direction.

Respectfully yours,
JOSEPH KALBFUS.
Secretary of the Game Commission.

5

New York State Conservation Department

Walter Mulford

BREEDING MALLARD DUCKS FOR PROFIT

BY

W. T. HORNADAY

AND

LEE S. CRANDALL

ALBANY, NEW YORK, 1912

ALBANY
J. B. LYON COMPANY, STATE PRINTERS
1912

STATE OF NEW YORK

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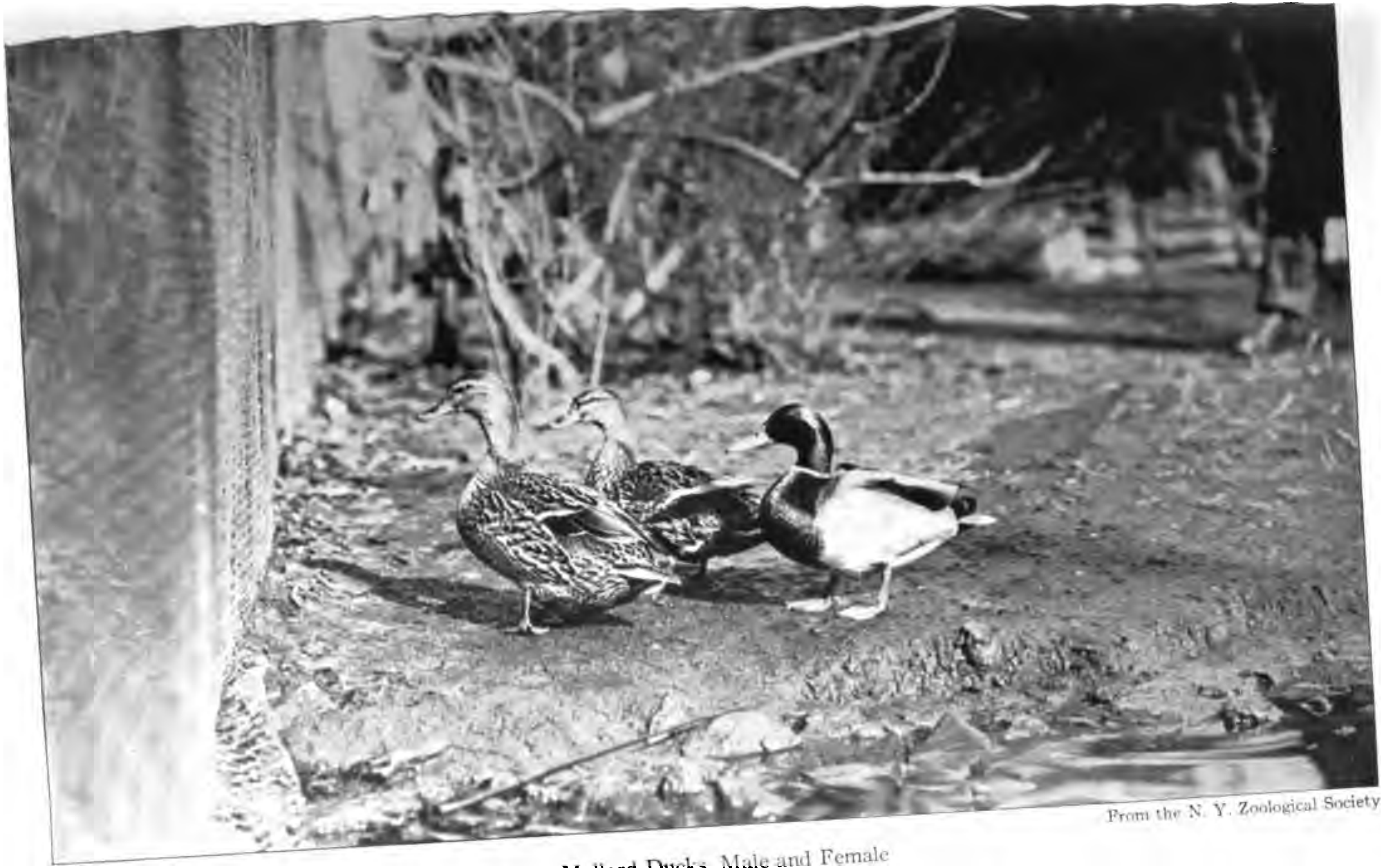


From the N. Y. Zoological Society

Mallard Ducks, Male and Female

Waterfowl in Winter, in the Zoological Park

BREEDING MALLARD DUCKS FOR PROFIT

By W. T. Hornaday and Lee S. Crandall

In endeavoring to supply, at short notice, the need of the State Conservation Commission for a paper on the breeding of mallard ducks, we do not advance the idea that we think we know *all* that there is to know about this subject. On the contrary, we regard the subject as one in which much remains to be discovered by those who propose to rear ducks on a commercial basis; and we offer only what we have learned in the New York Zoological Park by duck-breeding which was not done on a cash-producing basis. In the breeding of ducks for park purposes, our Bird Department has been very successful; and we now offer, for the benefit of the public, the results of our experience. We must also add that it is physically impossible for us to amplify these notes through the laborious channel of correspondence.

Of all American ducks the common Mallard (*Anas platyrhynchos*) is the most persistent and successful breeder. It quickly becomes accustomed to captivity, it enjoys park life, and when given even half a chance, it will breed and rear its young. Its nearest relative, the Black Duck (*Anas rubripes*) is of similar size and desirability as a food duck, but its difference in temperament is a serious obstacle to its propagation on a commercial basis. The black duck is more nervous and shy than the mallard, and its breeding is too easily interrupted.

Unquestionably, the mallard duck can be reared in captivity in numbers limited only by the extent of breeder's facilities. The amount of net profit that can be realized depends wholly upon the business acumen and judgment displayed in the management of the flock. The total amount of knowledge necessary to success is not so very great; but at the same time, the exercise of a fair amount of intelligence, and also careful diligence, is absolutely necessary. Naturally, the care and food of the flock must not cost extravagantly, or the profits will inevitably disappear.

THE POND

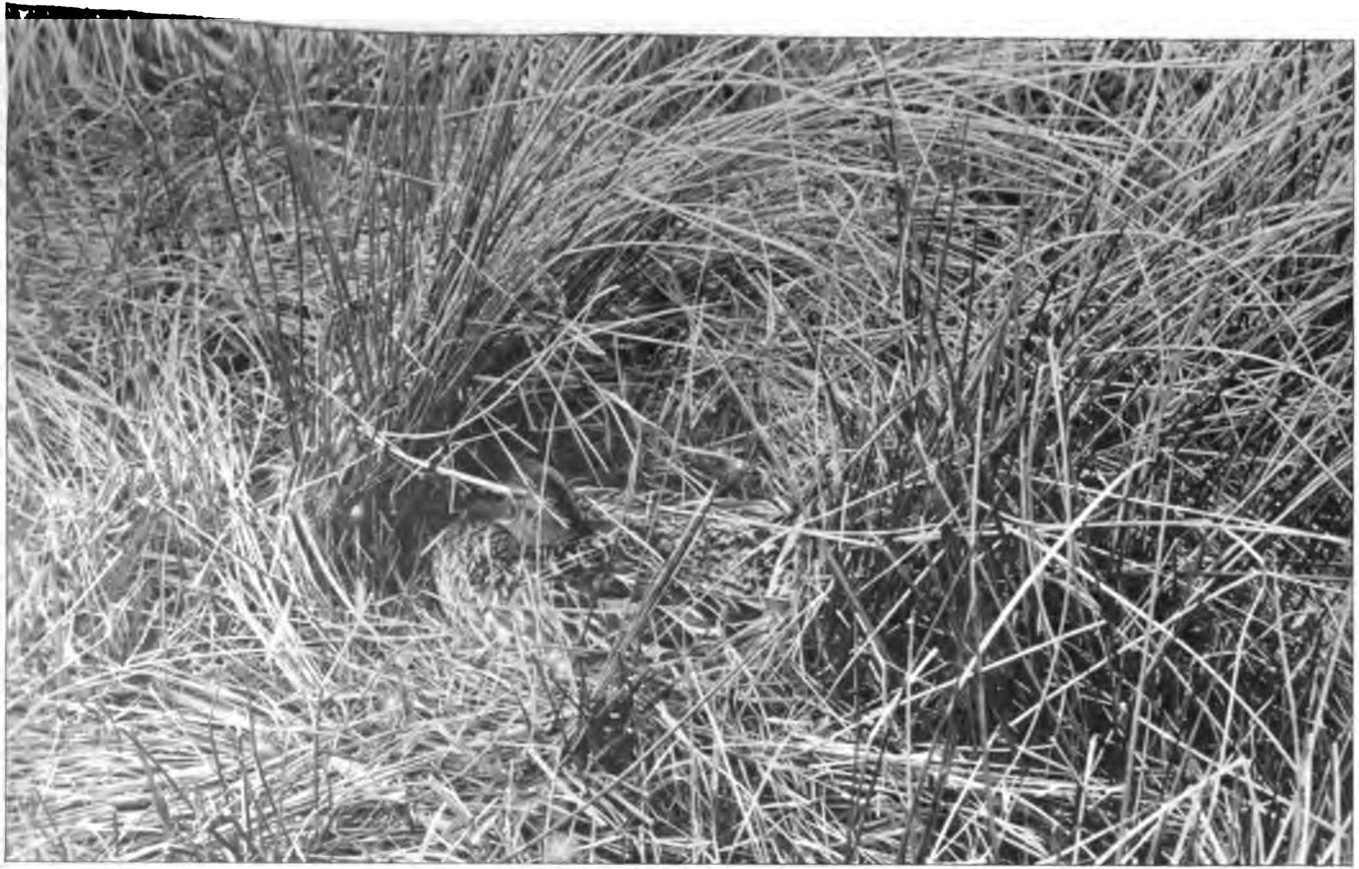
Fortunately for mallard breeding, an elaborate or costly plant is not necessary. The three things that are absolutely indispensable are a pond, a bit of meadow, and a certain amount of brush-covered ground, or a tract of rank grass.

The main reason for the pond is obvious — to keep the birds clean and in good health. Any farm that is traversed by a running brook is eligible for duck-farming operations. In case a pond does not exist, one can easily be made. A large pond will last a long time without being emptied and cleaned; but if the pond must be a small one, then the owner should establish it on such a basis that it can easily be emptied and thoroughly cleaned. For a small pond, the ideal bottom is one covered with concrete, so that the work of cleaning is rendered both easy and effective. If a pond has a gravelly bottom, it does not require any concrete; but a bottom of black earth, or swamp muck, should be paved in some manner, at the earliest moment. In constructing a pond for aquatic birds or mammals, its bottom should slope toward the outlet in such a manner that when the outlet is opened, the entire area will be quickly drained.

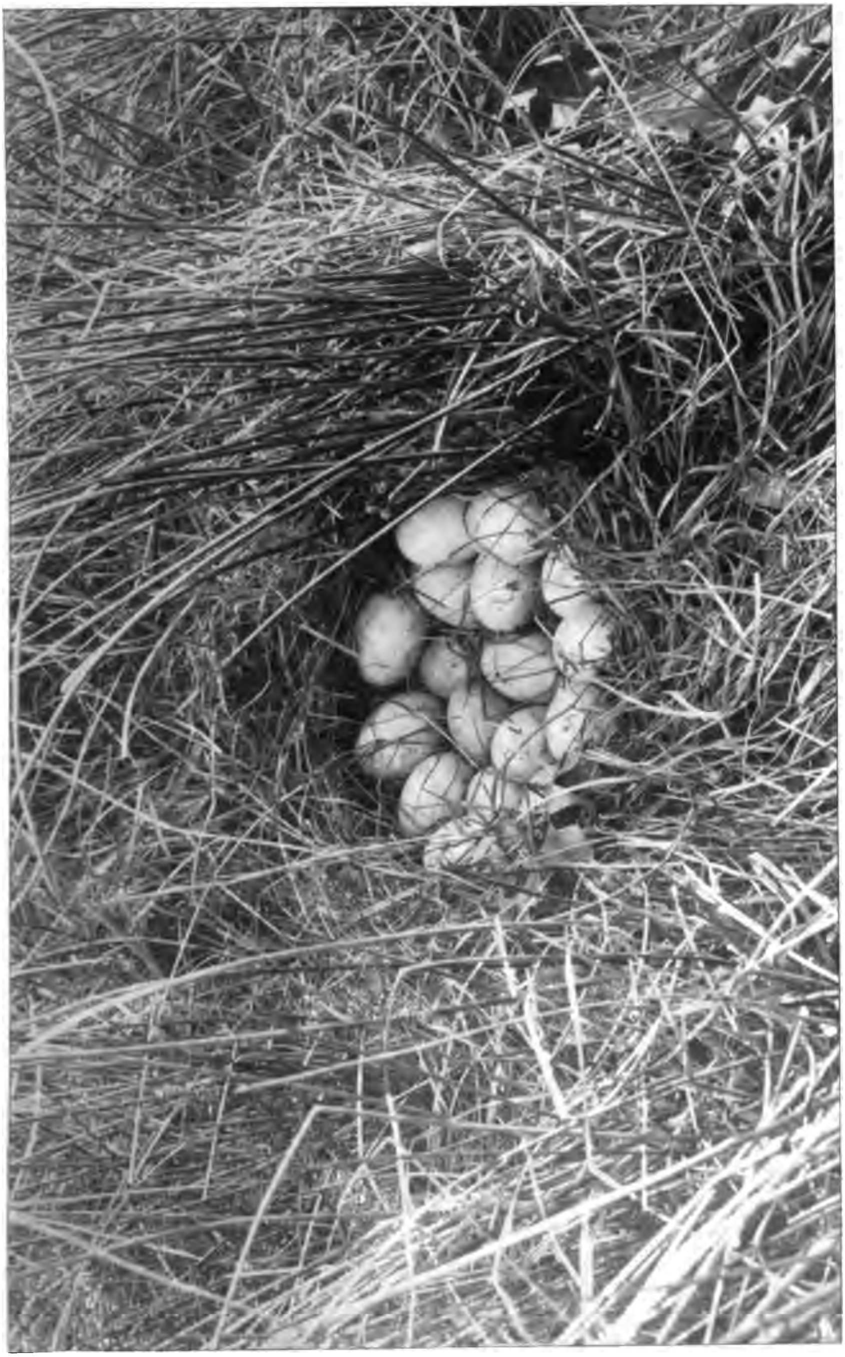
So long as the water in a pond can be kept reasonably clean, it will support a really large population of ducks. Although we never have tested the matter, we believe that in commercial duck-raising it will be sufficient to allow two square yards, (18 square feet) of water surface to each duck. Thus a pond 100 feet square would be sufficient for 555 ducks. It is to be carefully noted, however, that the water is to be kept reasonably clean; which means that a deep layer of excretions must not be allowed to accumulate on the bottom. It is understood that rarely, if ever, will all the ducks of a flock occupy the pond at the same time.

After the pond has been formed, the next step is to plant a large portion of the enclosure with thick cover, the most suitable plants for the purpose being willows, privet, etc. If plenty of tangled brush is provided, mallards will nest freely on the ground in sheltered nooks. It is always well, however, to supply a number of bottomless boxes about 15 inches square, laid on the ground, with an opening near the bottom large enough to permit the entrance of the bird.

If a natural pond or lakelet exists, of many acres in extent, an attempt should be made to induce the growth of various aquatic plants suitable for duck-food, such as wild celery (*Vallisneria*), wild rice (*Zizania*), duck weed (*Lemna*) and pond-weed (*Potamogeton*). If the pond is very small, or the number of ducks large, such plants will not be able to hold their own, and their introduction will be a waste of time. Of course in ponds that are periodically emptied and cleaned, plant life is impossible. In such cases, green food in some form must be provided, such as finely chopped fresh grass, cabbage or lettuce.



Nest of Mallard Duck Hidden in Rank Grass



Nest and Eggs of the Mallard Duck

BREEDING STOCK

And now as to the breeding stock. Pure wild birds can be obtained from any of the reliable dealers in live water-fowl, at prices ranging from three dollars to five dollars per pair, according to the season and the supply. Stock can be obtained of Wenz & Mackensen, Yardley, Pa.; G. D. Tilley, Darien, Conn.; J. W. Whealton, Chincoteague Island, Va.; Cecil French, Washington, D. C.; K. C. Beck & Company, Hutchinson, Kansas, and others.

If the pond and its enclosure is small, one drake to three or four ducks is sufficient. If the pond is of good size, one drake to two ducks is a safer proportion.

When the birds arrive, they should be confined for at least a day or two in a dry enclosure, until they have recovered from the effects of the journey, and are feeding well. When several days have been spent in transit, the quarantine must be of longer duration. Then, if they are already pinioned, they may be turned upon the pond. In case they are not pinioned, two courses are open. If it is nearly breeding time, the wings should simply be clipped, and the birds liberated, to be caught and pinioned *after* the laying season. Pinioning at this time might so upset the birds as to very materially affect their laying. If the nesting season is not at hand, the birds should be pinioned at once.

PINIONING

Pinioning is desirable and necessary to keep mallards from flying away; also to render it possible to catch them easily. The process is very simple, easily performed, and almost invariably successful. A careful study of the accompanying illustrations will make detailed explanations unnecessary. The ninth and tenth primary wing feathers, counting from the outside, should be removed, together with their " coverts," and the small feathers which clothe the wing at the point of insertion of the primaries. A tight ligature of stout, uncolored twine should then be tied about the wing, as close as possible to the junction with the thumb or bastard wing, on the side toward the tip. The ligature must be tight, a good knot for the purpose being shown in the illustration. The skin over the bone is severed, and the bone is then cut through, cleanly and evenly, at a point about a quarter of an inch beyond the ligature. The best instrument for this purpose is a strong pair of gardener's pruning shears, costing 75 cents. After the operation the bird may be returned to the water at once. If the operation has been properly performed, small loss of blood and none of life is to be feared.

FOOD

The birds should be fed once or twice daily on a mixture of wheat, buckwheat and barley, a little cracked corn being added during cold weather. Any soft food is eaten greedily, but there is no advantage to be gained by feeding it to healthy birds. Green food, also, should be given, as described above.

During the winter months, no shelter is required unless the weather be exceedingly severe. If the number of ducks is fairly large, they will keep open a place in the ice by their constant swimming; but if they fail to do this, the ice must be cut for them. It is open water that enables waterfowl to keep their feet from freezing. If the temperature is very low, or the flock small, it will be necessary to open a hole in the ice at least once daily. It is a simple matter to erect low shelters of brush or straw to break the wind, if needed; but no houses of any kind are necessary.

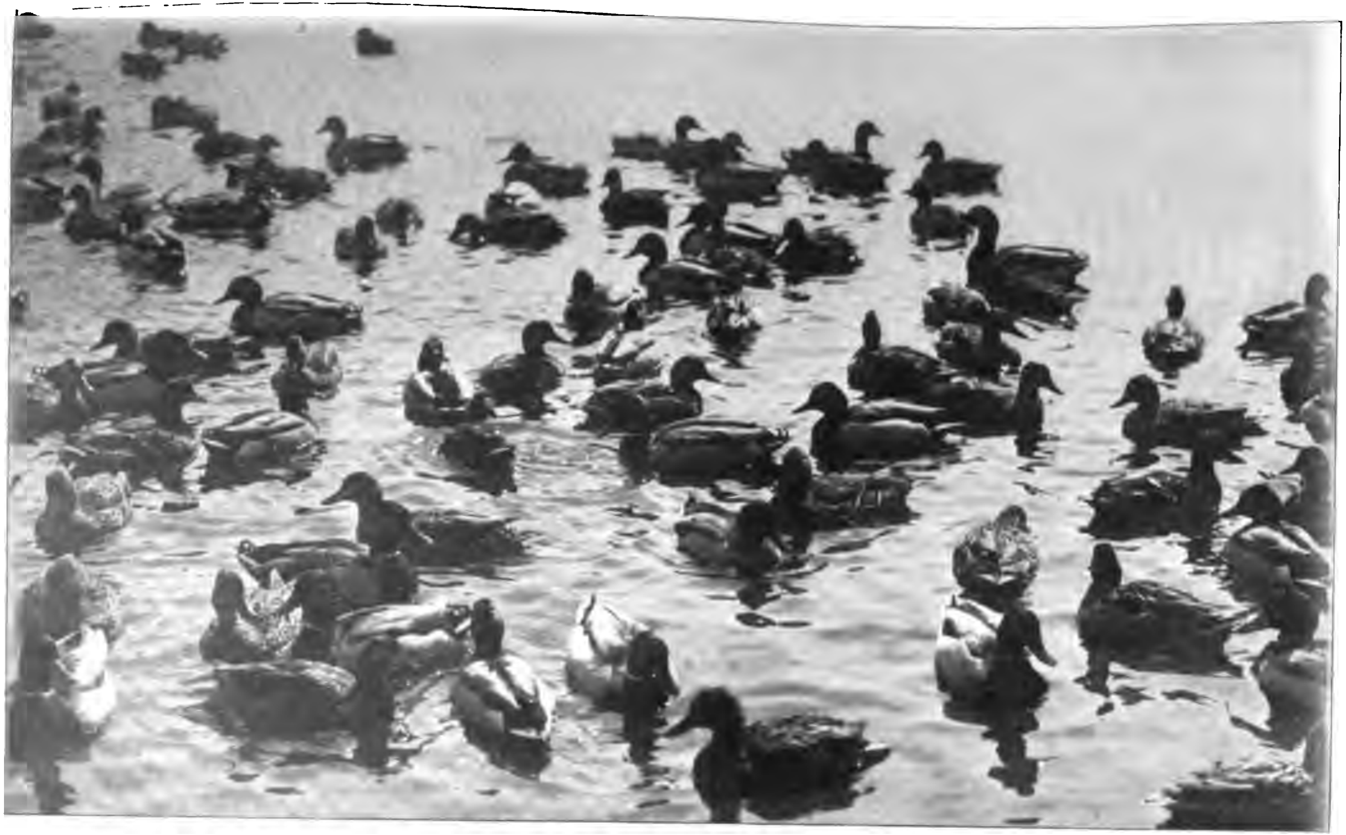
If the duck yard is specially exposed to the full sweep of the piercingly cold western and northwestern winds of our northern winter, then it will be well to erect, as a wind screen, a tight board fence six feet in height, along the western side of the duck enclosure.

BREEDING

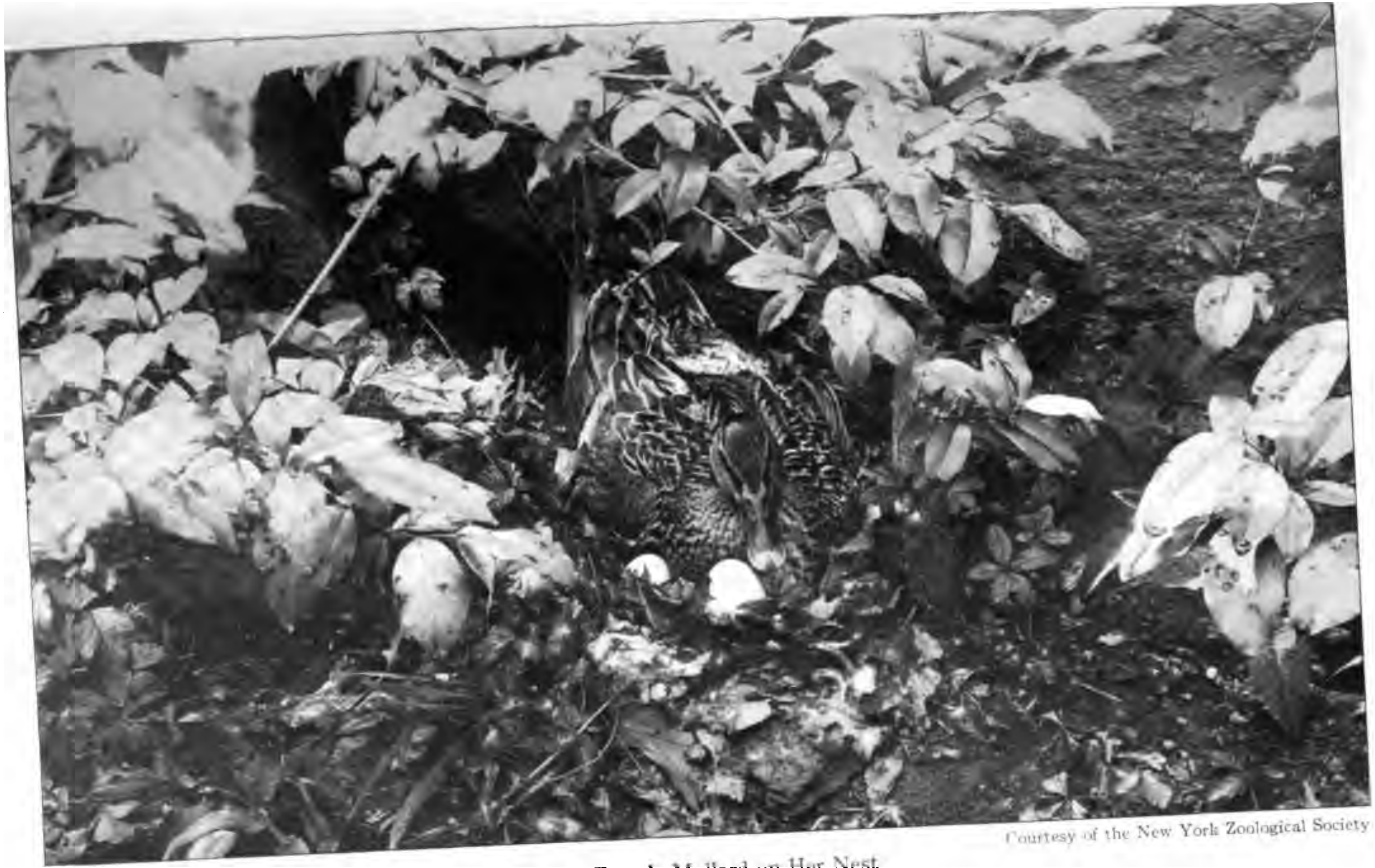
We know of but one profitable method to be followed in rearing the young. A few ducklings can be brought to maturity by allowing the duck to hatch and rear her own brood, but the losses from exposure and lack of regular and proper food make this method uncertain and impractical. When the ducks begin laying, great care must be taken not to disturb them. The eggs should be collected daily by the same person, and set under small hens, or placed in incubators. During the period of incubation, the eggs must be sprinkled frequently with warm water, to keep them sufficiently moist.

CARE OF DUCKLINGS

For the first twenty-four hours after hatching, the ducklings require no food or water. On the second day they should be placed in a brooder, or removed, with the hen that hatched them, to a dry, shady run, as nearly as possible impervious to vermin and cats. If natural shade is not sufficiently abundant, an artificial substitute must be provided. Temporary shade can be secured by stretching burlap on wooden frames. If possible every runway should be well carpeted with short, tender grass of which the young birds will



Mallard Ducks in the New York Zoological Park



Courtesy of the New York Zoological Society

Female Mallard on Her Nest

consume a great quantity. At first the food of ducklings should consist of a soft mixture of meals, such as is supplied by Spratts' Patent and other concerns. If this be not available, an efficient substitute may be made by mixing equal parts of middlings, barley meal and beef scraps, or crissel. The food should be scalded, mixed, and served as a crumbly mass, but not sloppy; and it should be doled out in small quantities at frequent intervals. Fine grit should be supplied in the form of clean sand or similar material. If the range be sufficiently large, the ducklings will add a great number of earthworms and insects to the menu.

Inasmuch as young ducklings should be reared away from the pond, pure water for drinking purposes should be supplied; and its depth should never exceed one inch. Convenient vessels for this purpose are sold by all poultry supply houses. Great care must be taken to prevent the water from becoming heated by exposure to the sun's rays.

When about one week old, all the young birds should be pinioned by removing the tip of one wing, the incision being made at a point about one-eighth inch beyond the thumb, as fully described and illustrated for adults. For ducklings, however, no ligature is required, as there is no bleeding. The wound may be dusted with some good antiseptic powder, such as xeroform, to prevent blowing by flies.

At the age of about six or seven weeks, the food of ducklings may be gradually changed to small grain. At this time, also, they may be turned upon the pond; and when they have become thoroughly accustomed to the grain, they may well be considered as safely reared.

ENEMIES

Undoubtedly, the worst enemies of young ducklings are cats and rats. Cats are sly robbers, hard to detect, and their abundance in a semi-wild state is increasing yearly. All wandering cats should be killed. Rats are determined and bloodthirsty vermin, and often they work for some time before their depredations are discovered. Cats, rats, mink and weasels must be kept down by means of traps, guns, and poison if necessary.

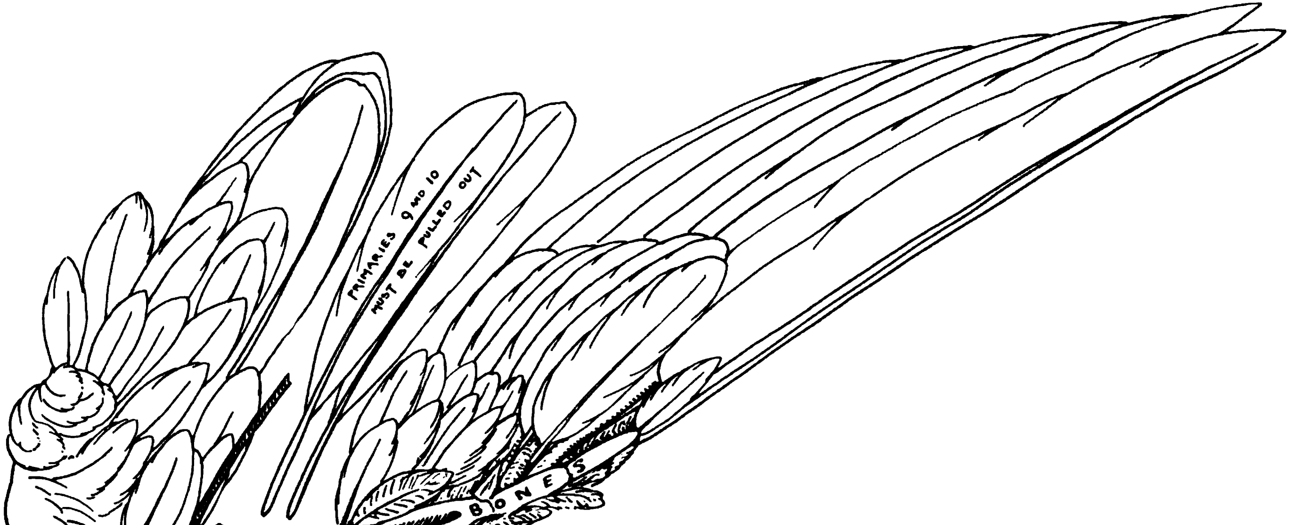
Crows will greedily take small ducklings, and eggs; and sharp-shinned and Cooper's hawks are ever ready to carry off the young birds. Snapping turtles, and such fish as pike, pickerel and bass, if allowed to live in a duck pond, will seize and devour a great many ducklings, and even attack the adult birds. All such aquatic scourges must be carefully kept out of duck-ponds.

MARKETING THE SURPLUS

The New York market always desires mallard ducks that can legally be sold and served, and it always will. The prospects are that the extra value attaching to the mallard on the bill-of-fare will make the raising of mallards much more profitable to the breeder than the rearing of the common domestic duck. Breeders should count upon disposing of their stock through the game and poultry dealers of New York, Albany, Buffalo and other large cities, because the hotels and restaurants of the cities are the natural consumers of high-priced meats.

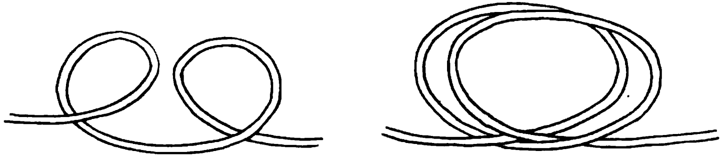
All preserve-bred mallard and black ducks must be killed and officially tagged in accordance with the regulations of the State Conservation Commission. Breeders can depend upon it that a very little trouble on their part will suffice to place all these operations on a thoroughly practical and sensible working basis. It is not possible for preserve-bred ducks to be killed by shooting when they are to be sold as food, because every large duck-pond, well populated with mallard ducks, attracts annually a certain number of wild ducks which under no circumstances can be shot according to the law, and marketed. Preserve-bred ducks must be caught and killed by hand; and pinioning renders this easily possible.

There are a few persons who claim that it is unsportsmanlike to kill a mallard duck " by hand; " but to this we reply that it is ten times more unsportsmanlike to shoot *tame*, preserve-bred mallards as they fly from their coops to their pond!

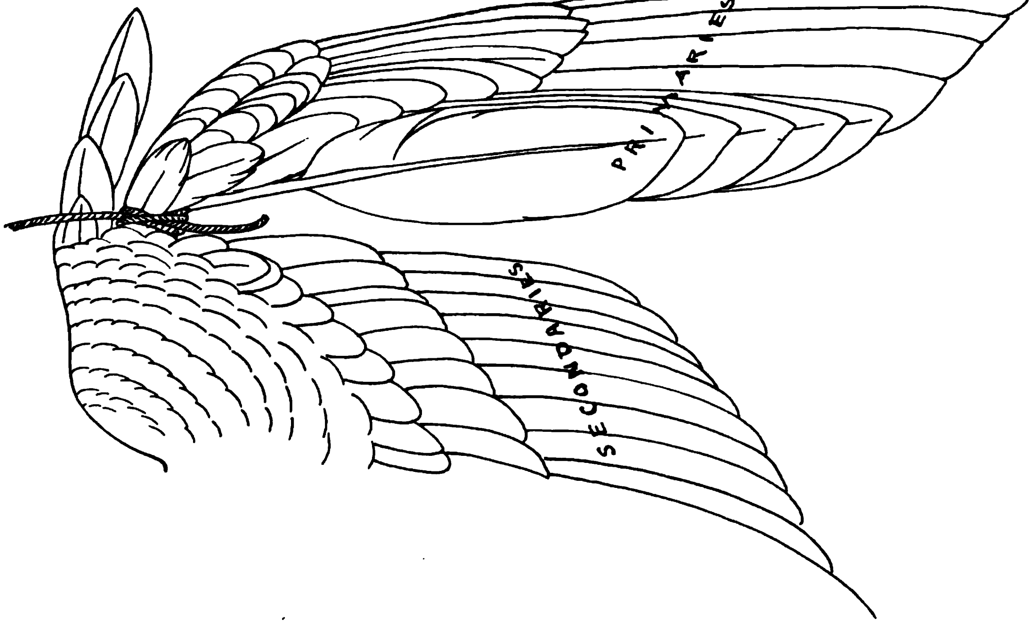


How to Pinion Ducks

Inside View of a Mallard's Wing, Showing Amputation and Tie.
Amputated Bones Exposed



How the Tie is Made



How to Pinion Ducks
Top View of a Mallard's Wing

PROPERTY OF
FORESTRY
AGRIC
OF CALIFORN
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UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 465

Contribution from the Bureau of Biological Survey
E. W. NELSON, Chief

Washington, D. C. ▼ February 23, 1917

PROPAGATION OF WILD-DUCK FOODS.

By W. L. McAtee, *Assistant Biologist.*

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INTRODUCTION.

Information concerning the propagation of valuable wild-duck foods is constantly requested by State game commissions, game protective associations, and sportsmen's clubs, and by individuals interested in the protection, preservation, and propagation of waterfowl. The Biological Survey has endeavored to meet the demand by issuing three publications[1] on the more important food plants of wild ducks, by correspondence relating to local problems, and in certain cases by special examination and report. The bulletins thus far published have contained accounts of the value, nature, range, and methods of propagation of 19 groups of plants comprising more than 60 species.

The present bulletin is a revision of the first two of these publications and discusses the following plants suitable for wild-duck food: Wild rice, wild celery, pondweeds, arrowheads (especially delta potato and wapato), chufa, wild millet, and waterlilies (especially the banana waterlily).[1] The kinds of foods that can be recommended for propagation must practically be restricted to those already on the market. This fact has controlled the selection of the varieties discussed in previous publications. It is highly desirable that dealers increase the scope of their stock so that persons interested may obtain seeds or other parts necessary for the propagation of additional kinds, a number of which are just as valuable as food for wild ducks as some now offered for sale. The best of these are shown in Table I.

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[1] Biol. Surv. Circ. No. 81, Sept. 9, 1911; and U. S. Dept. Agr. Bulls. No. 58, Feb. 7, 1914, and No. 205, May 20, 1915.

NOTE.—This bulletin is for general distribution among persons and organizations interested in the protection, preservation, and propagation of waterfowl. It supersedes Biological Survey Circular No. 81, dealing with wild rice, wild celery, and pondweeds; and Department Bulletin No. 58, dealing with delta potato, wapato, chufa, wild millet, and banana waterlily.

TABLE I.—*Wild-duck foods not at present on the market.*

No.	Common name.	Scientific name.	General range.	Local conditions.
1	Bur reed	*Sparganium eurycarpum*	United States	Marshes.
2	Do	*Sparganium angustifolium*	Northern States	Quiet water.[2]
3	Pondweed	*Potamogeton heterophyllus*	Northern Hemisphere	Do.
4	Do	*Potamogeton pusillus*	do	Do.
5	Do	*Potamogeton filiformis*	Northern States	Do.
6	Do	*Potamogeton interior*	Western States	Do.
7	Western widgeon-grass	*Ruppia occidentalis*	do	Saline lakes.
8	Horned pondweed	*Zannichellia palustris*	Cosmopolitan	Fresh or brackish water.
9	Bushy pondweed	*Naias flexilis*	Northern Hemisphere	Quiet water.
10	Arrowhead	*Sagittaria longiloba*	Western States	Shallow water.
11	Do	*Sagittaria rigida*	Northern States	Do.
12	Do	*Sagittaria teres*	Atlantic coast	Do.
13	Do	*Sagittaria graminea*	Eastern States	Do.
14	Do	*Sagittaria papillosa*	Gulf States	Do.
15	Grass	*Panicum condensum*	Eastern States	Swamps.
16	Switch grass	*Panicum virgatum*	United States	Wet soil.
17	Salt-marsh grass	*Spartina cynosuroides*	Atlantic coast	Salt marshes.
18	Cord grass	*Spartina michauxiana*	Eastern States	Fresh or brackish marshes.
19	Do	*Spartina gracilis*	Western States	Saline soil.
20	Meadow grass	*Panicularia nervata*	United States	Wet soil.
21	Bulrush	*Scirpus americanus*	Cosmopolitan	Fresh or brackish marshes.
22	Do	*Scirpus validus*	North America	Shallow water.
23	Do	*Scirpus occidentalis*	United States	Do.
24	Do	*Scirpus paludosus*	do	Salt marshes.
25	Do	*Scirpus robustus*	Atlantic coast	Do.
26	Do	*Scirpus fluviatilis*	Northern States	Shallow water.
27	Do	*Scirpus cubensis*	Gulf States	Swamps.
28	Saw grass	*Cladium effusum*	Southeastern States	Coast marshes.
29	Sedge	*Carex decomposita*	Eastern States	Swamps.
30	Wampee[3]	*Peltandra virginica*	do	Shallow water.
31	Pickerel weed[3]	*Pontederia cordata*	do	Do.

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[1] Other plants are included in Department Bulletin No. 205 (25 p., 23 figs.), as follows: Musk grass, duckweeds, frogbit, thalia, water elm, swamp privet, eelgrass, widgeongrass, watercress, waterweed, and coontail.

[2] Where not specified, fresh water is to be understood.

[3] This plant now on sale by some dealers.

Table I.—*Wild-duck foods not at present on the market*—Continued.

No.	Common name.	Scientific name.	General range.	Local conditions.
32	Smartweed	*Polygonum amphibium*	United States	Shallow water.
33	Do	*Polygonum pennsylvanicum.*	do	Wet soil.
34	Do	*Polygonum opelousanum*	Eastern States	Do.
35	Do	*Polygonum hydropiperoides.*	United States	Do.
36	Do	*Polygonum hydropiper*	Northern Hemisphere.	Do.
37	Do	*Polygonum punctatum*	North America	Do.
38	Do	*Polygonum sagittatum*	United States	Do.
39	Saltwort	*Salicornia europæa*	Northern Hemisphere.	Salt marshes and sea beaches.
40	Do	*Salicornia ambigua*	Both coasts	Do.
41	Water primrose	*Jussiæa leptocarpa*	Southeastern States	Swamps.
42	Water pennywort	*Hydrocotyle umbellata*	United States	Do.

Were all these plants available to persons interested in improving the food supply of wild ducks the outlook would be most satisfactory, for from these and the plants hitherto listed and described something of value could be selected for almost any environmental condition.

Classifying the plants recommended for propagation according to the conditions to which they are suited, we have as a salt-water plant, eelgrass; for brackish water, widgeon-grass, sago pondweed, and wild celery, all of which also grow in fresh water, the last two abundantly; for fresh water with slight current, wild rice, wild celery, all the pondweeds, and watercress; for fresh water that is quiet except for wind currents, pondweeds, banana waterlily, musk grasses, waterweed, and coontail; for the border line between water and marsh or for shallow fresh water, delta potato, wapato, wild millet, frogbit, and thalia; for small openings in marshes or other absolutely quiet waters, duckweeds; for the margin of fresh water where there is no marsh, wild millet; for land dry in summer and overflowed in winter, chufa and wild millet; for bodies of fresh water, almost always full but sometimes drying up in summer, in shallow places wapato and delta potato, and in deeper water, the tuberous white waterlily; and for swamps, swamp privet and water elm.

A recent study of the vegetation of the lakes of the Nebraska sandhill region discloses the important fact that widgeon-grass and sago pondweed withstand alkaline conditions better than any other plants. It is probable that wild celery also will be found to have a degree of endurance of alkalinity.

Some of the new plants listed in Table I are especially desirable, because they are suitable for certain situations besides those inhabited by the plants mentioned in the last two paragraphs. They include six for salt marshes (namely, Nos. 17, 18, 21, 24, 25, and 28), two for salt marshes and sea beaches (39, 40); one for saline lakes (7), two for fresh or brackish marshes (18, 21), one for fresh or brackish water (8), and eight for wet soil (16, 20, and 33 to 38); there are also five for swamps (15, 27, 29, 41, 42) in the number.

WILD RICE.

VALUE AS DUCK FOOD.

Wild rice (*Zizania palustris* and *Z. aquatica*) in every stage of its growth is eaten by one or another of the North American ducks and geese, and practically all of them feed on its ripened grain. It is the staple fall food of many ducks in the numerous rice marshes of eastern United States. The seeds are obtained mainly from the bottom in shallow water, where they have fallen into a bed of soft muck to await germination. Germination is often so delayed that grain may sprout at any time up to at least 18 months after ripening. This accounts for the fact that young shoots and germinating seeds of wild rice are found in ducks' stomachs at practically all seasons. The shoots are devoured by many species, the flowers have been found in the wood duck's stomach, and the stems and leaves of the mature plants are eaten by geese. Wild rice constituted more than 17 per cent of the food of 209 mallards examined, 12 per cent of that of 51 black ducks, and over 11 per cent of that of 75 wood ducks. Other species known to feed upon the plant are the Canada goose, snow goose, pintail, widgeon, lesser and greater scaups or bluebills, canvas-back, redhead, green-winged and blue-winged teals, buffle-head, and ruddy duck.

DESCRIPTION OF PLANT.

Wild rice is a tall, round-stemmed grass with long, flat, pointed leaves (fig. 1). The stem, which may be as much as 2 inches in diameter, is hollow, but is furnished with transverse partitions between as well as at the joints. These partitions may be seen when the stem is cut lengthwise. The base of the stem is in the form of a stout hook, and from it arise the numerous fibrous roots which serve mainly to anchor the plant to the bottom. The flowers of wild rice usually appear during the latter part of July, but may be found as late as November. The appearance of the flower head is very characteristic (fig. 1); the lower branches, which bear the staminate or male flowers, are widely separated and stand out from the stem, while the upper branches of pistillate flowers are erect and more

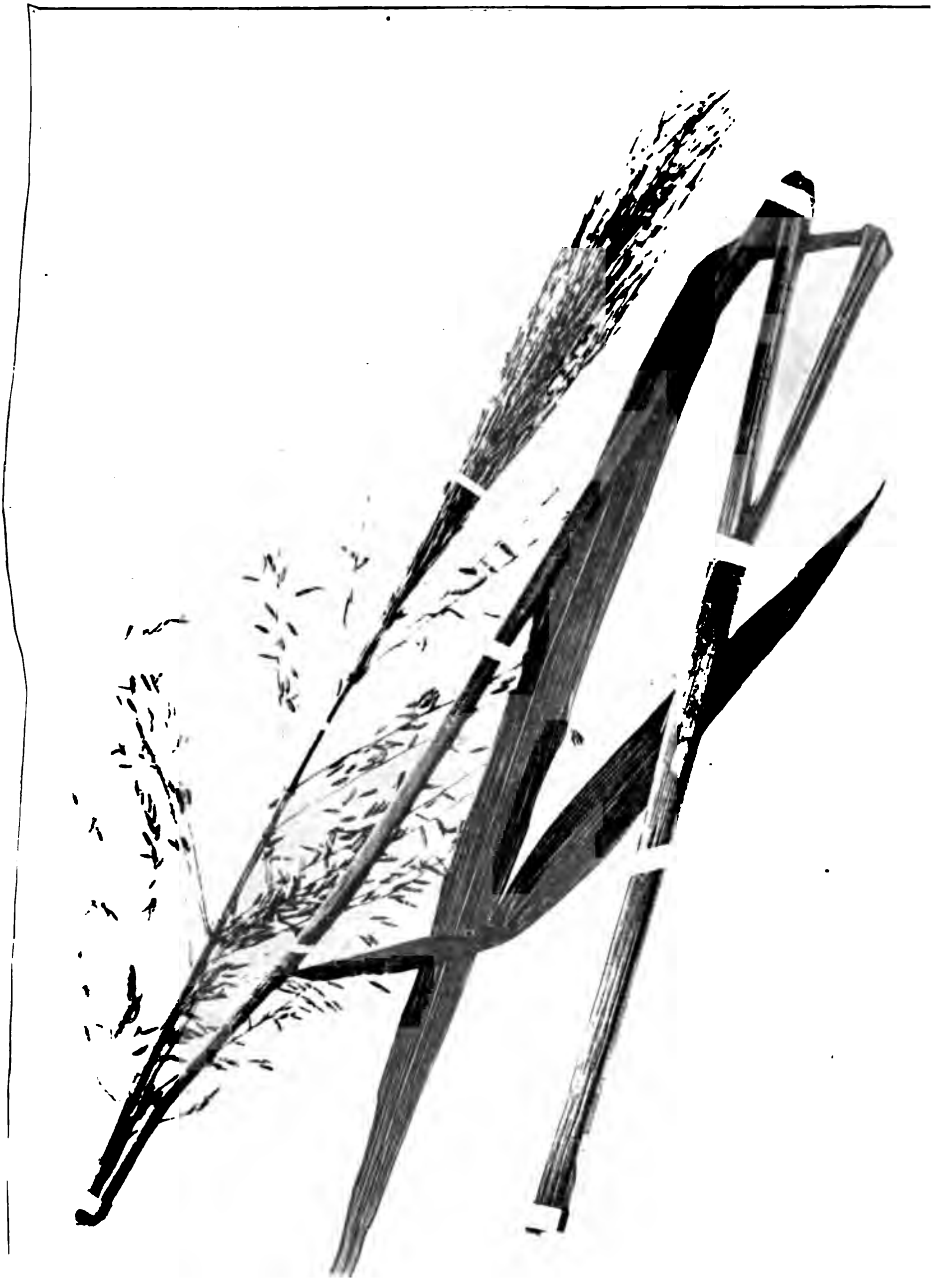

FIG. 1.—Wild rice in flower. (One-half natural size.)

compactly grouped. The grain (fig. 2, A) of wild rice is from one-half to three-fourths of an inch in length, slender, of uniform diameter, and with rounded or pointed ends. A low rib runs along the whole length of one side and a shallow groove along the other. The husk of the seed (fig. 2, B) has six longitudinal grooves and a long, pointed beak, the whole being an inch and a half or sometimes even more in length. The appearance of the flower head or of the grain distinguishes wild rice from any other aquatic grass in its range.[1]

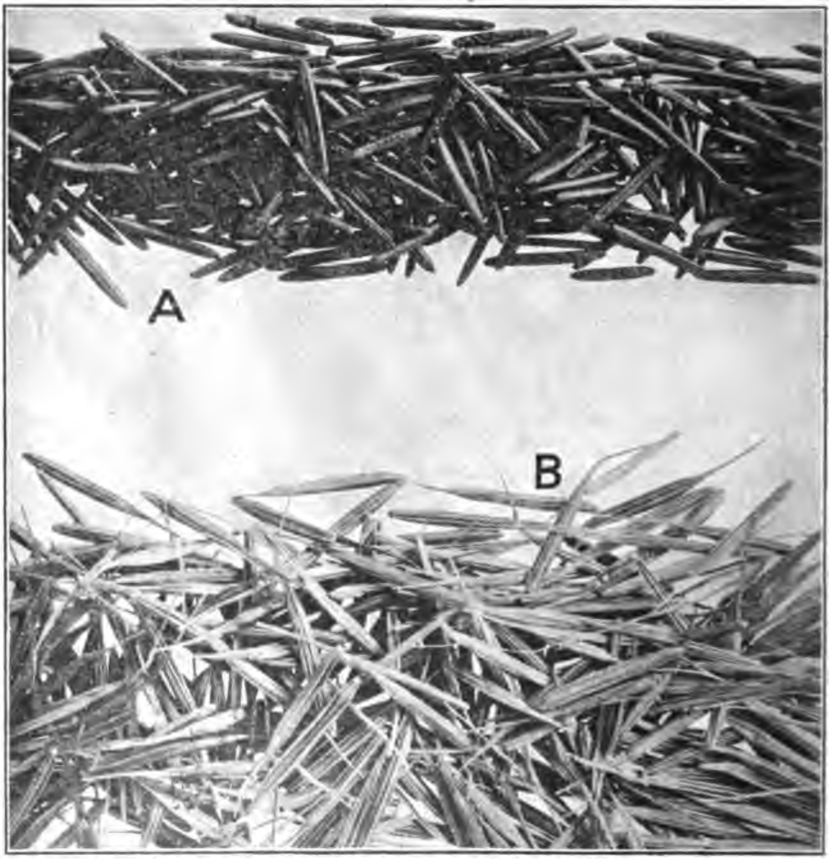

FIG. 2.—Wild rice seed: (A) With the hull off and (B) with the hull on. (From Bull. 50, Bureau of Plant Industry.)

DISTRIBUTION.

Natural growths of wild rice have been found from the northern end of Lake Winnipeg eastward along the northern shores of the

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[1] The southern white marsh or folle avoine (*Zizaniopsis*), superficially much like *Zizania*, does not have the flower head as a whole divided into pistillate and staminate parts, and the grain is ovoid and without a long beak.

Great Lakes and the St. Lawrence River to New Brunswick;[1] from the central Dakotas, western Nebraska, and eastern Texas to the Atlantic coast; and as far south along that coast as central Florida (fig. 3). The plant is rather local and of course is confined to the lowlands. The center of its abundance is in Wisconsin, Iowa, and Minnesota.

PROPAGATION.

Although wild rice does not grow naturally in every suitable place within its range, in most cases it can be made to do so by transplanting. Formerly wild rice was often transplanted by various tribes of Indians, and investigations by the Bureau of Plant Industry have shown that with proper treatment of the seed the plant may be propagated in any favorable waters in the country. It has also been successfully grown in Europe. The black spots on the accompanying map (fig. 3) represent numerous localities where it has been successfully transplanted in North America. The showing thus made should encourage those who are looking for a plant to make barren waters attractive to ducks, and especially those who have already tried wild rice without success. However, experimenters must be prepared for occasional failure, for the plant sometimes refuses to grow

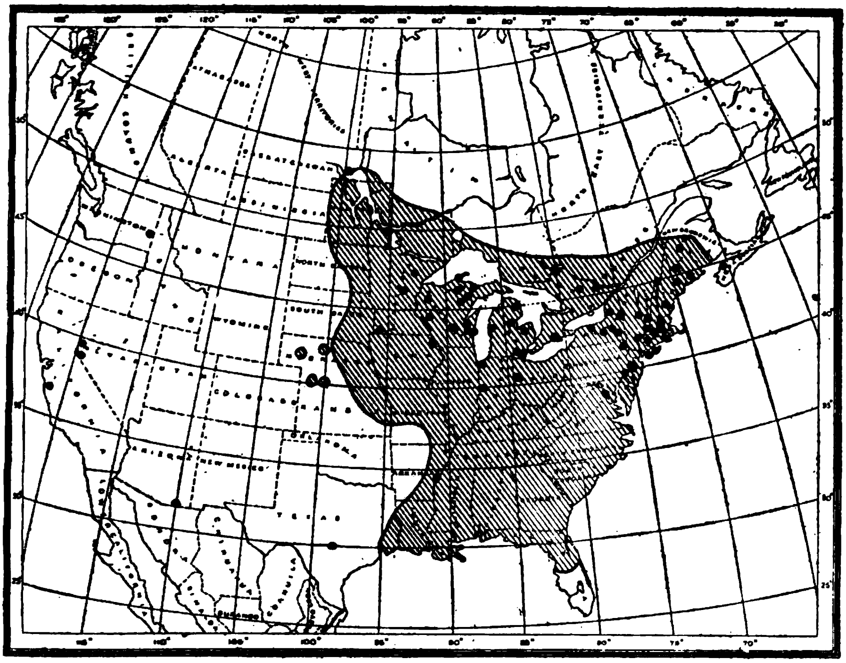

FIG. 3.—Range of wild rice. (Black spots show where it has been successfully transplanted.)

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[1] It is reported without definite locality from Newfoundland.

in localities which appear to possess every requisite for its successful propagation. The usual cause of failure has been improper treatment of the seed between the time of harvesting and sowing, resulting in loss of vitality. When growing naturally, the ripe seeds fall directly into the water, where they sink, and, being provided with barbed beaks, penetrate deeper and deeper into the muck surrounding the roots of the parent plant. There they lie through the winter. They may germinate in spring, or they may lie practically dormant through still another cold season. The seeds therefore remain wet until ready to sprout; they are exposed to currents of water, are not in close contact with each other, and are not subjected to very high temperatures. To succeed with wild rice it is necessary to imitate nature's methods. Keeping large quantities of the seed in close contact often causes fermentation, but this can be prevented by cold storage.

So far as propagation depends on the preservation of the vitality of the seed, the methods so carefully worked out by the Bureau of Plant Industry[1] insure success. Several seed firms handle wild rice properly and will deliver it in either spring or fall as desired. The grain is kept wet and in cold storage, and when shipped is packed in damp moss or fiber.

Sometimes when the stand of wild rice has become reduced it is advisable to prevent consumption by ducks by harvesting the grain and then sowing it after the spring migration. Because the seeds of wild rice ripen and drop off a few at a time, they must be collected every day or so, or the heads must be bunched and tied, so as to prevent the loss of seed. The grain may perhaps be allowed to stand a short time in cold water, if the water is changed daily. But when the whole crop has been gathered it should be placed at once in cold storage, at a temperature just above freezing (from 32° to 34° F.), but still exposed to the air in an open cask or vat.

In cold climates seed may sometimes be perfectly preserved by improvised methods. For instance, wild rice seed kept out of doors and covered with water which was changed daily during the winter, except when frozen, germinated very satisfactorily. It has been stored also in partly filled burlap bags, among which blocks of ice were placed, and the whole covered with sawdust and kept wet. Usually, however, where cold storage is not available it is better to buy seed from a reliable firm.

Where to plant.—Wild rice thrives best on a mud bottom, though it has been known to grow in sand. This may be underlain by various soils, but there should be a layer of mud from at least 2 to 4 inches deep, and preferably deeper. Wild rice usually does not do well where there is much current or change in the level of the water, although it grows abundantly on tide flats. It is not adapted to entirely stagnant water.

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[1] Bull. 50, 1903; Bull. 90, Pt. I, 1905.

It may also be added that the salt-water limits of wild rice may be determined approximately by the simple test of taste. When water is appreciably salty to the taste it is too salty for the successful growth of this plant.[1]

From 4 inches to 6 feet of water are about the limits of its usual occurrence, and it does best in from 1 to 3 feet. In shallow water it may be killed by heat in summer, so it is best, in southern localities especially, to sow the seed in not less than 2 feet of water.

How to plant.—The least possible time must intervene between removal from cold storage and sowing. Broadcast sowing answers every purpose, and the seed should be thickly sown, as, when near together, the growing plants support each other, the root anchorage is protected, and a good stand is more likely to result than if the seed is more widely scattered.

When to plant.—Fall has usually been considered the most desirable time for sowing, but it has been proved that seed sown in spring will bring a full crop, and for several reasons spring sowing is usually advisable. Where seed has been sown in fall, the bottom may freeze and the seed be carried off by the ice in spring. Ducks and other waterfowl, as well as some fishes, eat the seed, and the less it is exposed to their depredations the more abundant will be the crop. Seed is likely also to be buried by depositions of mud, or swept away by currents, especially in freshets. These dangers may be avoided by sowing late enough in spring to avoid the worst spring freshets, but in time to get the benefit of the first good growing weather; that is, when the temperature of the water approaches 60° F.

WILD CELERY.

VALUE AS DUCK FOOD.

The names wild celery (*Vallisneria spiralis*) and canvas-back duck have been closely associated in the annals of American sport. To a certain extent this association is justified, since the canvas-back evidently is very fond of the subterranean propagating buds of this plant. However, the assertion that the flavor of the canvas-back is superior to that of any other duck and that this depends on a diet of wild celery is not proved, to say the least. The scaups, or bluebills, and the redhead also are very fond of wild celery, and are fully as capable of getting the delicious buds as is the canvas-back. Several other ducks get more or less of this food, the writer finding that even the scoters on a Wisconsin lake in fall lived almost exclusively on it for the time. All parts of the plant are eaten by ducks, but the tender winter buds (fig. 8) and rootstocks are relished most. Wild celery buds can usually be obtained only by the diving ducks, as the bluebills, redhead, canvas-back, and scoters. The nondiving species, as the mallard, black duck, baldpate, and the geese, get an occasional bud, but more often they feed upon the leaves. Wild fowl not thus far specifically mentioned which also feed upon wild celery include the wood ducks, pintail, ruddy duck, buffle-head, whistler, green-winged and blue-winged teals, greater and lesser scaups or bluebills, white-winged and surf scoters, and whistling swan.

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[1] Scofield, C. S., Bull. 72, Bureau of Plant Industry, Pt. II, p. 8. 1905.

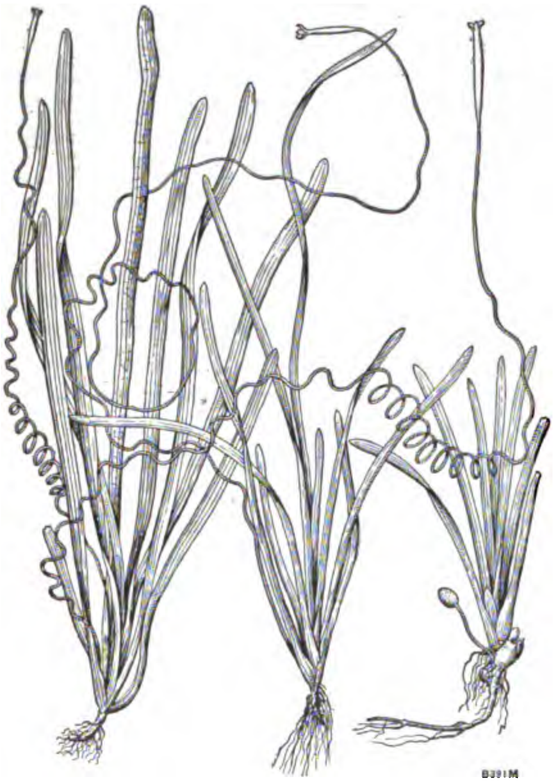


FIG. 4.—Wild celery. (Reduced. From Reichenbach.)

DESCRIPTION OF PLANT.

Wild celery (fig. 4) is a wholly submerged plant with long, flexible, ribbonlike leaves of light translucent green and of practically uniform width (anywhere from one-fourth to three-fourths of an inch) from root to tip. Of course the leaves are narrowed near the tip and may be somewhat serrate or wavy-margined there, but they are never expanded and the venation is peculiar. A leaf held up to the light displays numerous fine straight parallel veins running the whole length. There are, besides, one median and two lateral prominent veins connected at intervals by irregular cross veinlets (see fig. 5). Wild celery may be distinguished from eelgrass (*Zostera marina*), which lives in brackish or salt water, by the fact that its leaves grow in bundles from the rootstocks, while those of eelgrass arise singly and alternate on opposite sides of the stem. The leaves of wild celery generally are more than a fourth of an inch wide, while those of eelgrass are about that width or narrower. Pipewort (*Eriocaulon*), a fresh-water plant, often having ribbonlike leaves, may be recognized by the reticulation of the entire leaf into small cells by veins of nearly uniform size.

In certain stages some of the arrowheads (*Sagittaria*) are difficult to distinguish from wild celery, though they usually have the end of the leaf expanded into a proper leaf blade or else quite pointed, neither of which characteristics is to be found in *Vallisneria*. Investigation of the subterranean organs will decide the matter, however. For a description of those of *Sagittaria* see pages 25–26.

The flowers of wild celery, usually seen in July, are peculiar. The staminate flowers, at first attached at the base of the plants, later float on the surface of the water and fertilize the pistillate flower. The latter is attached to a long, slender, round stem, which contracts into a spiral, drawing the flower under the water after fertilization. This spiral stem, bearing the flower or pod (fig. 4), distinguishes wild celery from the other plants mentioned. The seed pod into which the pollenized flower develops is straight or curved, a little slenderer than a common lead pencil, and from 3 to 6 inches long (fig. 6). It contains, embedded in a clear jelly, small dark seeds, in number about 50 to the inch. No such pod is borne by any other fresh-water plant.

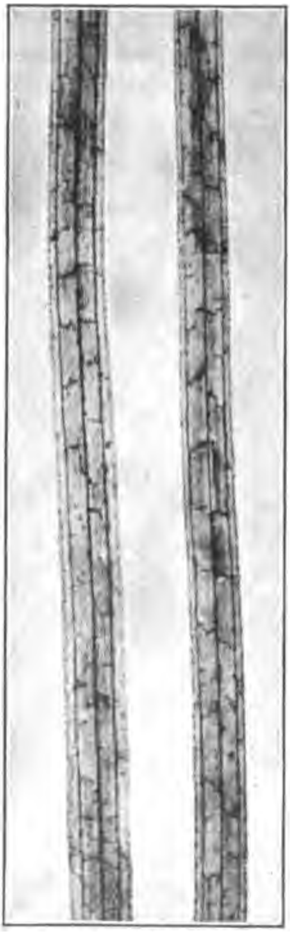


FIG. 5.—Leaves of wild celery, showing venation. (Natural size.)

DISTRIBUTION.

Wild celery occurs naturally from central Minnesota through the Great Lake region to northern Nova Scotia, and from eastern Kansas and eastern Texas east to the Atlantic coast (fig. 7). Like wild rice it is of more or less local distribution, and consequently may be absent from considerable areas within its general range.

PROPAGATION.

Wild celery is comparatively easy to transplant. It can be propagated both by seeds and by winter buds, and the plant itself may be taken up and set out at almost any time. Floating fragments of the plant with a little of the rootstock attached, picked up in midsummer by the writer, have rooted and grown successfully. The prime requisites in propagating celery are the same as in the case of rice; the buds, plants, or seeds must not be allowed to dry or to ferment between gathering and planting. The seed pods (fig. 6) ripen from September to November and fall to the bottom. They are best collected (by net or rake) on days when the water is least ruffled during the latter half of October and early November. The winter buds (fig. 8) may be collected at the same season, before the leaves have disappeared, by following the latter down and digging up the rootstocks and buds; or the young plants may be taken up in spring just as they sprout. They should be kept moist and cool until wanted for planting, as directed for wild rice. If they must be kept for some time they should be put in open vessels of water in cold storage.

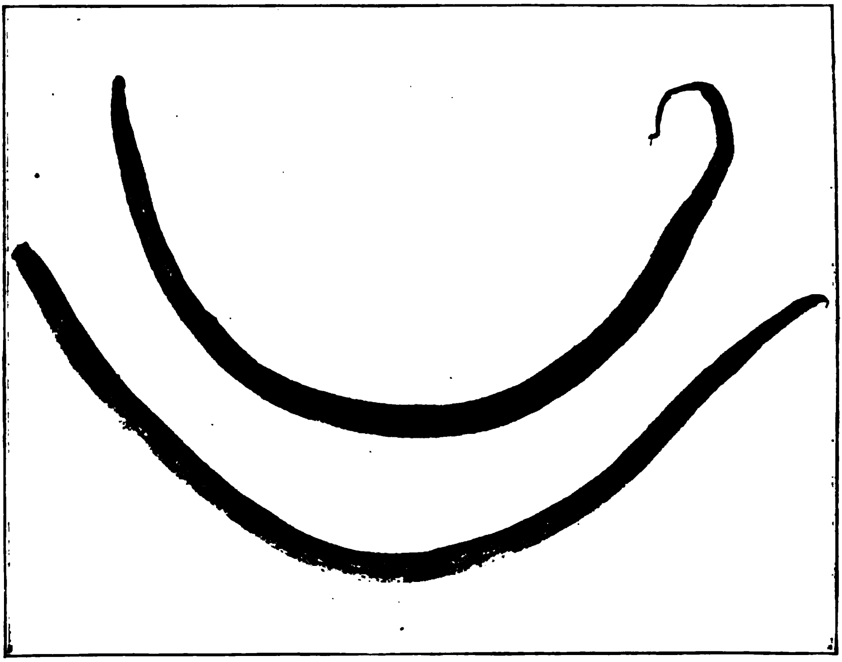


FIG. 6.—Seed pods of wild celery. (Natural size.)

Where to plant.—Wild celery grows best on muddy bottoms in from 3½ to 6½ feet of fresh water, though it will grow also in sand and in both deeper and shallower water. A sluggish current suits it better than either stagnant or rapid water.

How to plant.—For sowing, the pods should be broken up (in water) into pieces about half an inch in length, which may be sown broadcast—not too thickly, as the plant spreads rapidly by rootstocks and will soon make a dense growth. The winter buds or pieces of roots with tufts of leaves must be weighted to hold them to the bottom and enable them to take root. This may be accomplished by loosely threading several plants together and tying stones to them, or by embedding them in balls of clay. The broken seed pods also may be put into clay and dropped.

When to plant.—Where not likely to be covered by mud, the best time to sow the seed pods is in fall. Winter buds collected in fall should be kept in cold storage, and these, as well as young plants gathered in spring, should be set out in May or June.

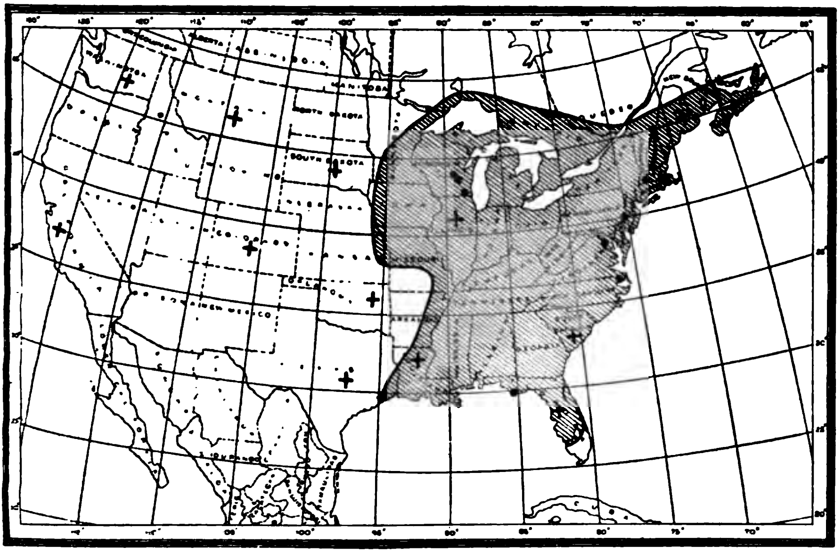


FIG. 7.—Range of wild celery. (Black spots show where it has been successfully transplanted. Crosses indicate States in which it has been propagated, the exact localities being unknown.)

PONDWEEDS.

VALUE AS DUCK FOOD.

Pondweeds (*Potamogeton*) compose a greater percentage of the food of wild ducks than wild rice and wild celery together. This is due to the wider distribution of pondweeds, allowing ducks to feed on them in winter as well as during migration and in the breeding season. There are no fewer than 38 species of pondweeds in the United States, of which at least nine (figs. 9–17) are of practically universal distribution. One of the number, the fennel-leaved or sago pondweed (*P. pectinatus*, fig. 17), produces upon the rootstocks numerous tubers (fig. 18) which are eagerly sought by certain ducks.

This one species makes up five-eighths of the whole quantity of pondweeds eaten by the canvas-back and more than a fourth of the entire food of the bird. Thus it constitutes a slightly greater proportion of the subsistence of the bird than does wild celery. The importance of this plant was pointed out several years ago by Mr. H. L. Skavlem, of Janesville, Wis., who found that at Lake Koshkonong its tubers formed from 60 to 80 per cent of the canvas-back's food.

Besides the tubers on the roots, some pondweeds have winter buds among the leaves, and these, as well as the seeds, rootstocks, and indeed the whole plant, are eaten by ducks. As many as 350 tubers and no fewer than 560 seeds have been found in single stomachs. Pondweeds are really staple food for ducks, and nothing is more common in the stomachs than the seeds of these plants.

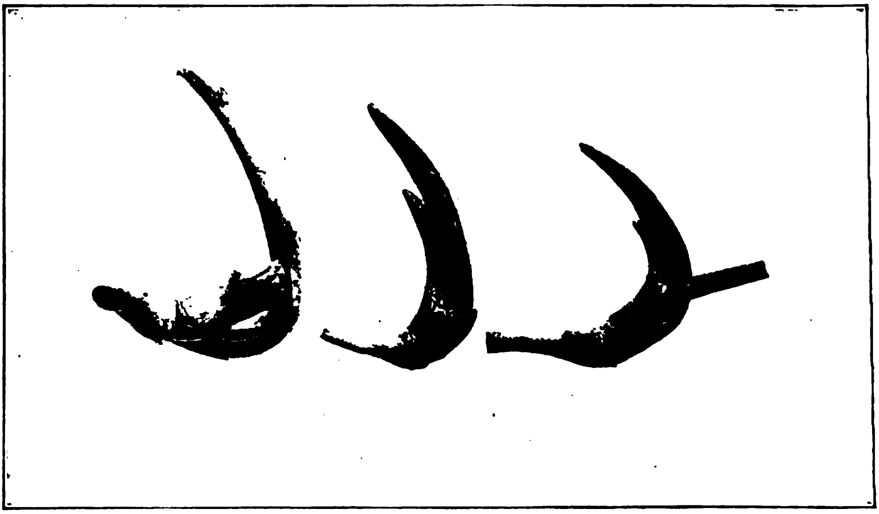


FIG. 8.—Propagating buds of wild celery. (Natural size.)

The many species of pondweeds present a diversity of forms. Illustrations (figs. 9–17) of the nine species of general distribution serve to show the general appearance of some of these plants. All pondweeds are eaten by ducks, and any species would be a valuable acquisition for a ducking ground.

The pondweed illustrated by figure 14 (*P. perfoliatus*) is known as redhead or duck grass, and is an important duck food, said to be especially attractive to redheads. More has been found in the stomachs of canvas-backs than of any other species. All told, 10 species of *Potamogeton* have been identified from duck stomachs, including all but one of the nine most widely ranging forms (figs. 9–17).

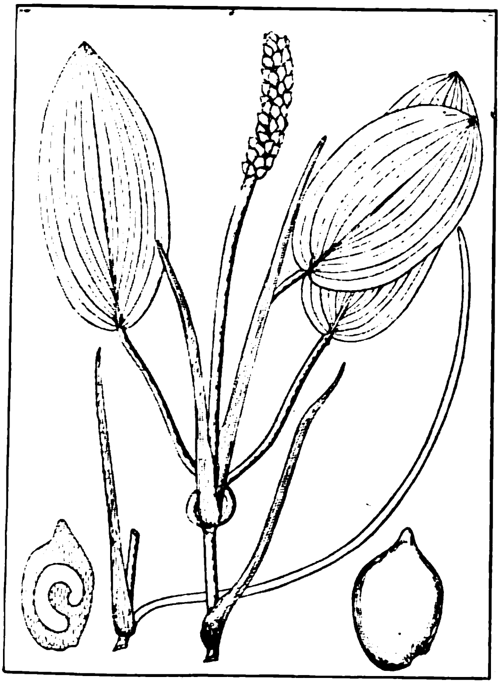
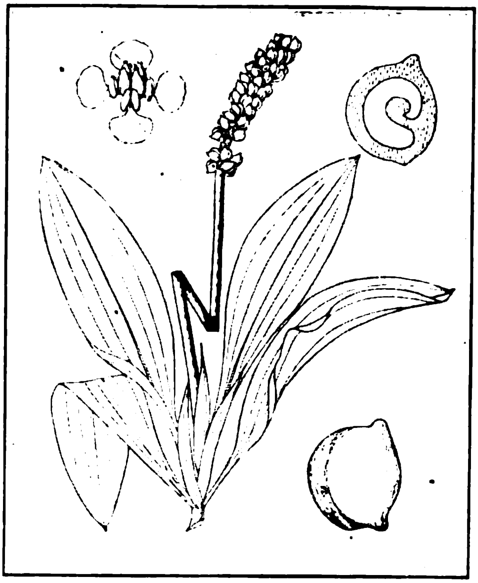
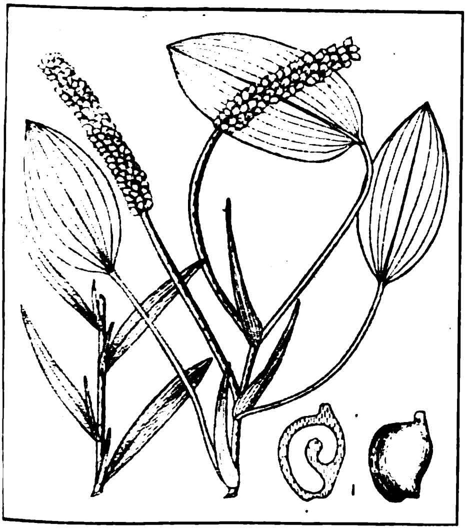


FIG. 9.—*Potamogeton natans.* B394M



B395M

FIG. 10.—*Potamogeton lucens.*



B396M

FIG. 11.—*Potamogeton heterophyllus.*

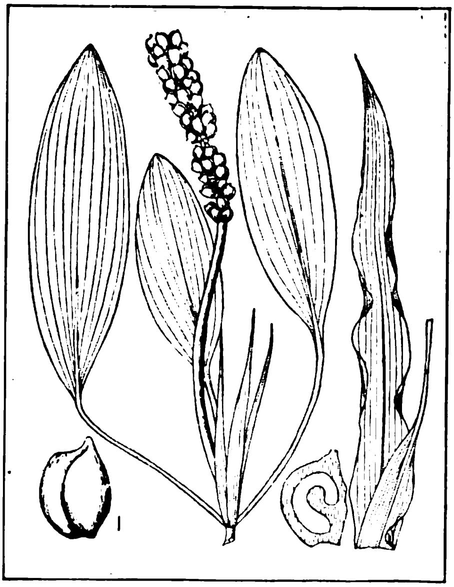


FIG. 12.—*Potamogeton lonchites.* B397M

FIGS. 9–12.—Wide-ranging species of pondweeds. (From Morong.)

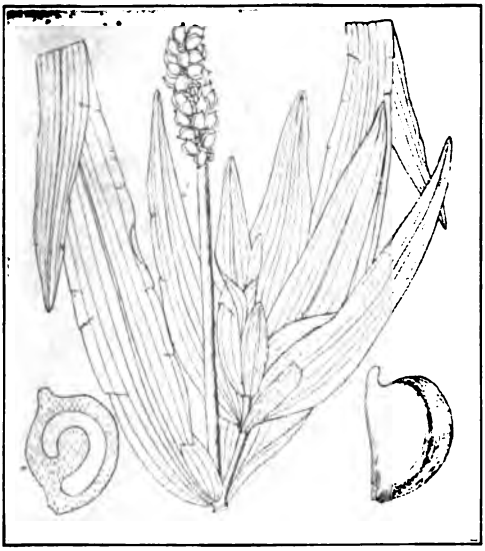


FIG. 13.—*Potamogeton prælongus.* B398M

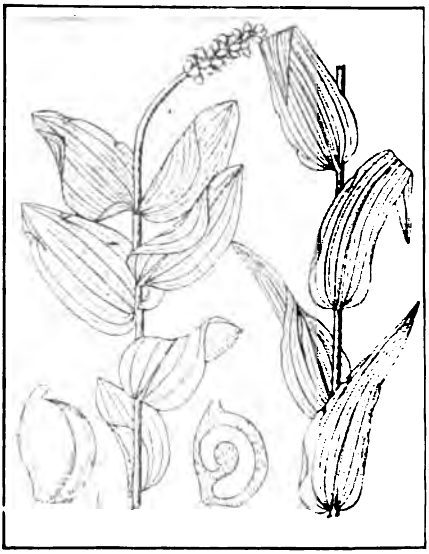


FIG. 14.—*Potamogeton perfoliatus.* B399M

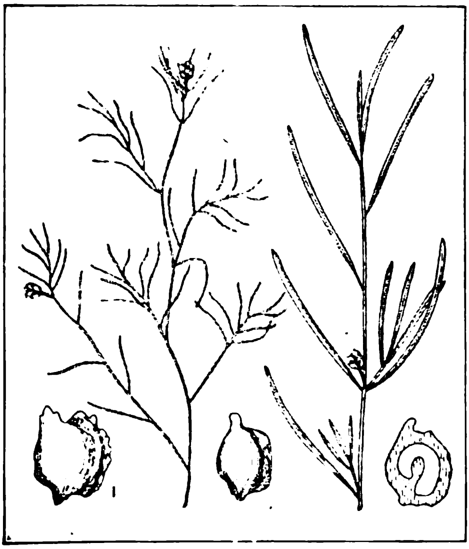


FIG. 15.—*Potamogeton foliosus.* B400M

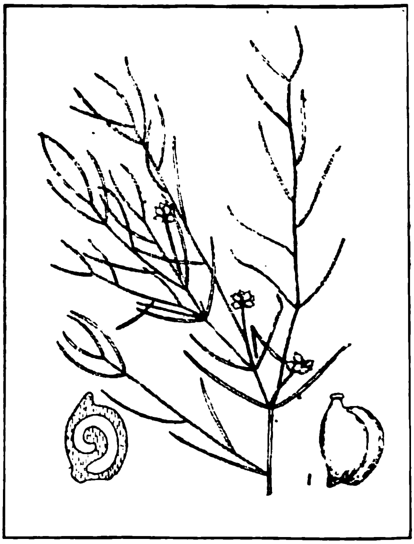


FIG. 16.—*Potamogeton pusillus.* B401M

FIGS. 13–16.—Wide-ranging species of pondweeds. (From Morong.)

The species of ducks and swans thus far found to feed upon pondweeds are the following: Sheldrake, red-breasted merganser, hooded merganser, mallard, black duck, Florida duck, gadwall, European widgeon, American widgeon, green-winged, blue-winged, and cinnamon teal, shoveller, pintail, wood duck, redhead, canvas-back, greater and lesser scaups, ring-necked duck, golden-eye, buffle-head, white-winged and surf scoters, ruddy duck, and whistling swan.

DESCRIPTION OF PLANTS.

The most important species, so far as known, is the sago pondweed (*Potamogeton pectinatus*). This plant has numerous, rather long, threadlike leaves, which present a loose, broomlike appearance in the water. The plant is in some places known as foxtail grass. It is known also as eelgrass, and apparently is the plant termed in Europe poker or pochard grass, after a duck closely related to our redhead. In autumn sago pondweed bears small clusters of light-brown seeds or nutlets near the surface of the water, in form somewhat like loose bunches of grapes. The other pondweeds bear seeds in the same way, and vast numbers of them are eaten by ducks.

The general appearance of sago pondweed is well shown by figure 17; note the brush of fine threadlike leaves and the seed clusters as above described. Here also are shown the tender rootstocks with their tubers, delicacies much sought by many ducks. Figure 18 illustrates the tubers natural size.

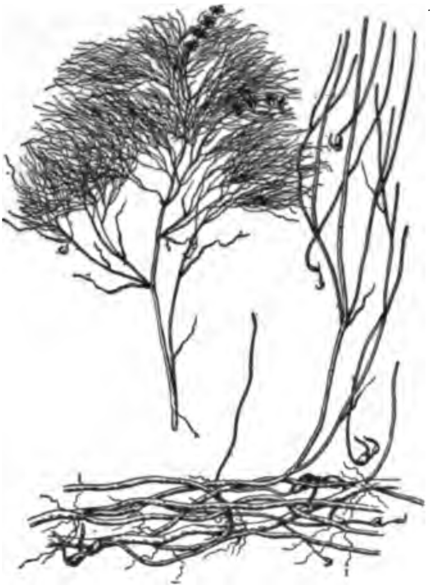


FIG. 17.—Sago pondweed. (Reduced. From Sunset Magazine, February, 1905.)

All pondweeds of the *pectinatus* group have tubers, and may therefore be substituted for sago pondweed for propagating purposes. These species are similar in general appearance and hardly distinguishable by the layman. The scientific names and general ranges of the species in the *pectinatus* group are as follows:

Potamogeton filiformis	Northern States, Southern Canada.
Potamogeton interior	Ontario, British Columbia, Colorado, Utah.
Potamogeton latifolius	California, Nevada.
Potamogeton interruptus	Michigan, Saskatchewan, Nebraska.

A pondweed with abundant tuberous rootstocks (*P. heterophyllus*, fig. 11) promises to be of exceptional value, since it changes its form and continues growth when the water surrounding it lowers or dries up. Parts of this plant for propagation are not yet on the market.

DISTRIBUTION.

The range of the sago pondweed is from coast to coast as far south as Florida, Texas, the Mexican plateau, and Lower California, north to Nova Scotia and Hudson Bay, and along the Pacific coast up to latitude 62° north (fig. 19). The distribution of other species has been indicated above.

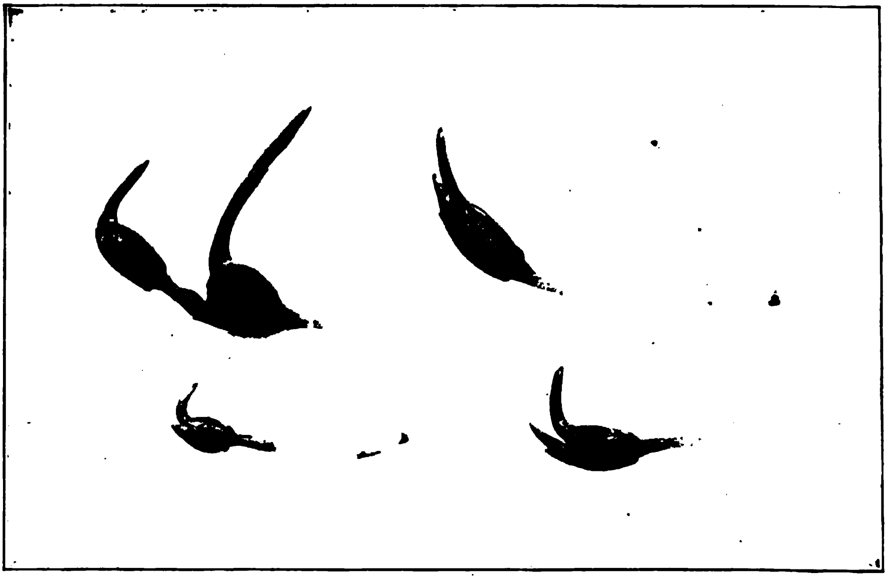


FIG. 18.—Tubers of sago pondweed. (Natural size.)

PROPAGATION.

Sago pondweed is easily transplanted by means of the seeds, which are usually gathered with a short section of the top of the plant. Growth from seed may be so delicate as to escape notice the first season, and yet the pond may be filled the second season, for the plant grows much more luxuriantly after the root system becomes well established. Quicker results may be obtained by planting tubers, but these are rather difficult to obtain in quantity. Success has recently been achieved in transplanting young plants of this species, even after shipping them considerable distances.

Stations of the U. S. Bureau of Fisheries use pondweeds to some extent in fish ponds and no difficulty seems to be encountered in transplanting them. Mr. Dwight Lydell, of the Michigan State fish hatchery, states that he has succeeded in propagating *Potamogeton* by means of seeds and of whole plants. He further states that the most successful and largest growths have been on bottoms where the mud is about 6 inches deep over sand or clay. By mowing the plants in lakes where they are plentiful and scattering them about the ponds, no trouble has been experienced in getting a good crop.

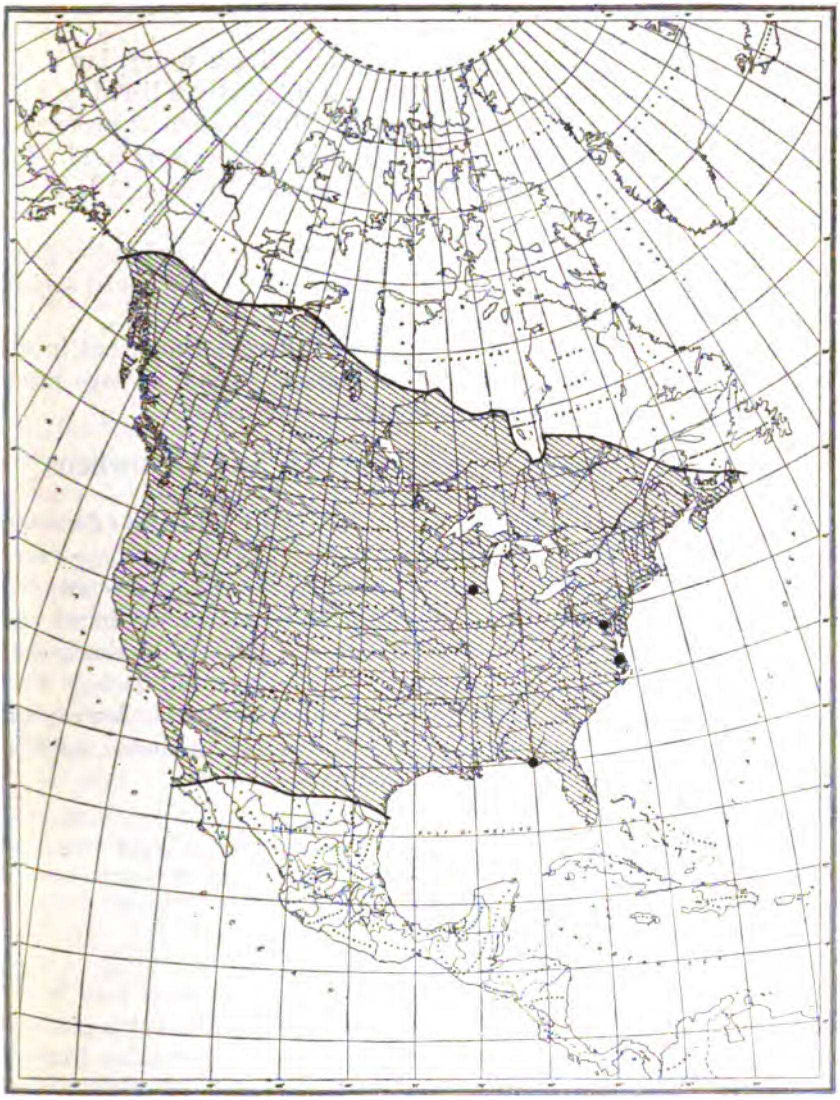


FIG. 19.—Range of sago pondweed. (Black spots show where it has been successfully transplanted.)

How to plant.—Pondweeds may be transplanted on a large scale by mowing[1] the whole plants with the seeds attached and scattering about where growth is desired. The seeds alone may be collected and sown broadcast, or they may be embedded in clay balls and distributed over the bottom.

Where to plant.—Most pondweeds require fresh water, but a few species, including the sago pondweed and its relatives listed on page 17, will grow in brackish or salt water. Mud bottom is preferable, but both sago pondweed and redhead grass will grow on sand. The water in which pondweeds are planted should be from 2 to 6 feet deep.

When to plant.—The seeds may be planted immediately after gathering, or if cold storage is available they may be held until spring, as described in the case of wild rice.

Seeds of the various species ripen at different times, but in the North they may be looked for after August. Those of sago pondweed are in best condition in September and October.

ENEMIES OF WILD RICE, WILD CELERY, AND PONDWEEDS.

The three genera of plants thus far discussed—wild rice (*Zizania*), wild celery (*Vallisneria*), and pondweeds (*Potamogeton*)—vary greatly in abundance. The causes of this diversity are not well understood, but the plants have enemies whose habits are known and whose attacks may to some extent be warded off. Wild rice is generally eaten by moose, deer, and cattle, but where the damage warrants the necessary expenditure these animals can be fenced out. Muskrats tear up and eat these plants, but, so far as known, not to a serious extent. Carp also feed on them, and—

> the evidence seems to be pretty strong that in general they are very destructive, and are probably in large part at least responsible for the great destruction of wild celery and wild rice that has been noted in many of our inland marshes in the last few years. This, in turn, has deprived certain ducks, especially the canvas-back and redhead, of an important food supply, and has undoubtedly influenced their abundance to some extent in the localities in question.[2]

In waters controlled exclusively by one interest, carp may be extirpated by partial or complete drainage and by the netting of the fish, together with the construction of wire screens or other barriers across all inlets and outlets. Where this is not practicable, systematic poisoning with fish berries or copper sulphate may succeed, but only at the expense of many forms of life besides the carp, and in the long run it might be more injurious to the duck food than to the carp. However, these methods are applicable only in small bodies of water; elsewhere effective measures against carp are impracticable

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[1] A description of the machine for mowing aquatic plants may be found in the Report of the U. S. Fish Comm., 1892, pp. 477–478.

[2] Cole, Leon J., Appendix Rept. Comm. Fisheries, for 1904, p. 592, 1905.

THE ARROWHEADS.

Several of the 27 species of *Sagittaria* found in the United States have leaves shaped like the points of Indian arrows, a fact that has given the group the common name of arrowheads. A number of the species, however, never have arrow-shaped leaves, the leaves being oval, lanceolate, or even without a blade in the ordinary sense of the word. Species of both groups are tuber-bearing, however, and therefore important as food for wild ducks. The species which are valuable on this account include those listed on page 2, which are not at present on the market, and the delta potato and wapato, here treated in detail.

DELTA POTATO.

VALUE AS DUCK FOOD.

In the latter part of January and early February, 1910, the writer, under authorization of the Biological Survey, visited the Mississippi Delta, La., chiefly to find out what attracts large numbers of canvas-backs to this shoal-water region, the shallow ponds and lakes of which are so different from the comparatively deep-water bodies frequented by canvas-backs in the Northern States. The attraction was found to be a tuberous species (*Sagittaria platyphylla*), known to the hunters of this and other parts of Louisiana as wild potato or wild onion. From an examination of a large number of stomachs it was found that about 70 per cent of the food of the canvas-backs collected consisted of the tubers of this plant, as did also more than 65 per cent of the food of the mallards. The pintail also fed upon the tubers. The gullet of one canvas-back was filled to the throat with the delta potatoes, 24 entire ones being present, besides ground-up remains of several others. Other individuals had 14 to 17 of the tubers in their gullets. There is no doubt that *S. platyphylla* is an important food for the larger species of ducks, not only in the Mississippi Delta, but throughout the whole range of the plant.

DESCRIPTION OF PLANT.

The delta potato (fig. 20), when well developed, stands about 18 inches above the soil. The broadly elliptical leaves have a characteristic firm appearance and a beautiful clear green color. Like all plants of its genus, this species produces flowering peduncles from about the center of the group of leafstalks; these peduncles bear flowers in whorls of three, and the individual flowers each have three white petals and a yellow center. The petals soon fall and the small green balls of immature seeds remain. These enlarge during the summer, and when ripe are brown and nearly half an inch in diameter. They are easily crushed, separating into hundreds of thin triangular seeds.

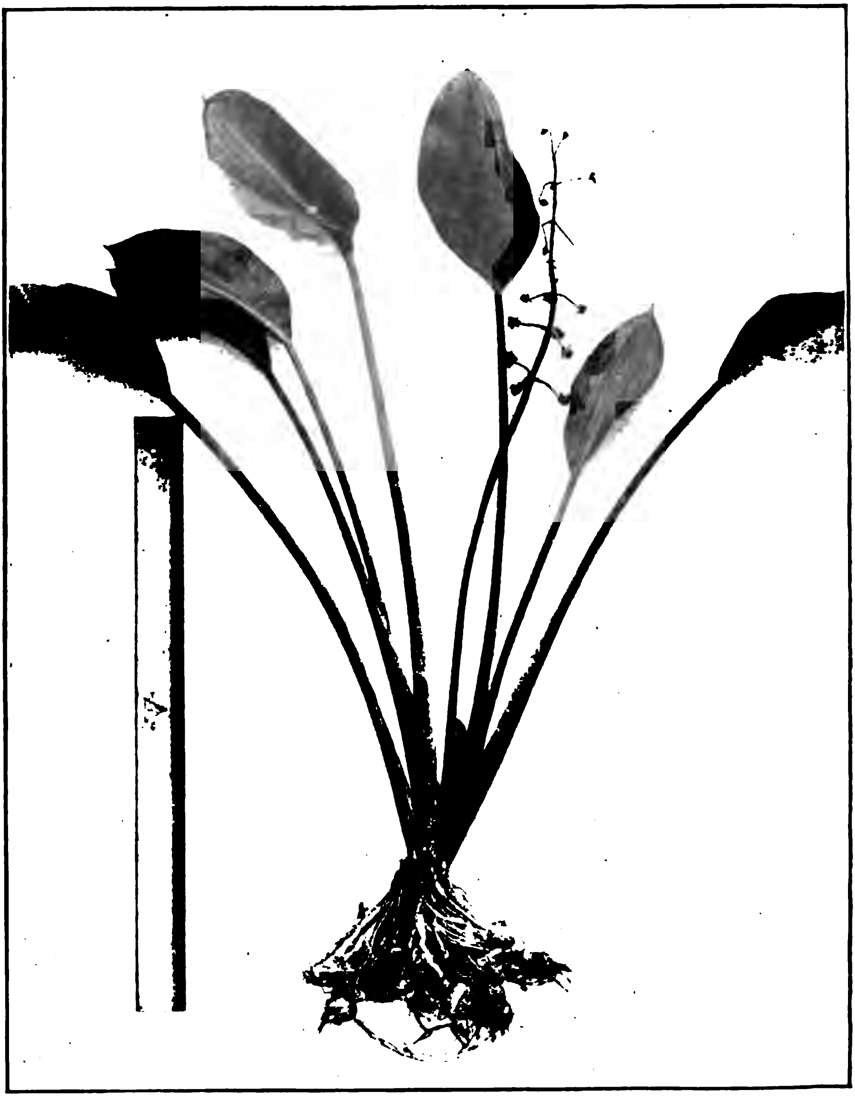

FIG. 20.—Delta potato. (Scale is 18 inches long.)

The tubers are of irregular globular shape and vary up to an inch in diameter. They are formed at the ends of runners (thicker than the fibrous roots) and bear on the side opposite the attachment to the runner a scale-sheathed bud which may be an inch or more in length.

Running around the body of the tuber are two or three darker lines from which originate fibrous sheaths. A glance at the illustration of the tubers (fig. 21) of this species shows the aptness of the name "wild potato." It should be explained, however, that normally the tubers are more widely separated than is the case with those on this particular specimen, which was grown in a flower-pot.

DISTRIBUTION.

In ancient times the Mississippi River emptied into a vast bay which extended at least as far north as the region now known as southern Illinois. Its actively growing delta (which is still apparently in full vigor) made thick deposits of silt over some thousands of square miles of this area while the remainder was being slowly elevated. *Sagittaria platyphylla* is so nearly confined in its distribution to this ancient basin, and is so characteristic of the present delta, that the name delta potato is eminently fitting. The outlying points of the range of the plant as now known are San Antonio, Tex., Lake City, Mo., Chattanooga, Tenn., and Mobile, Ala. (fig. 22).

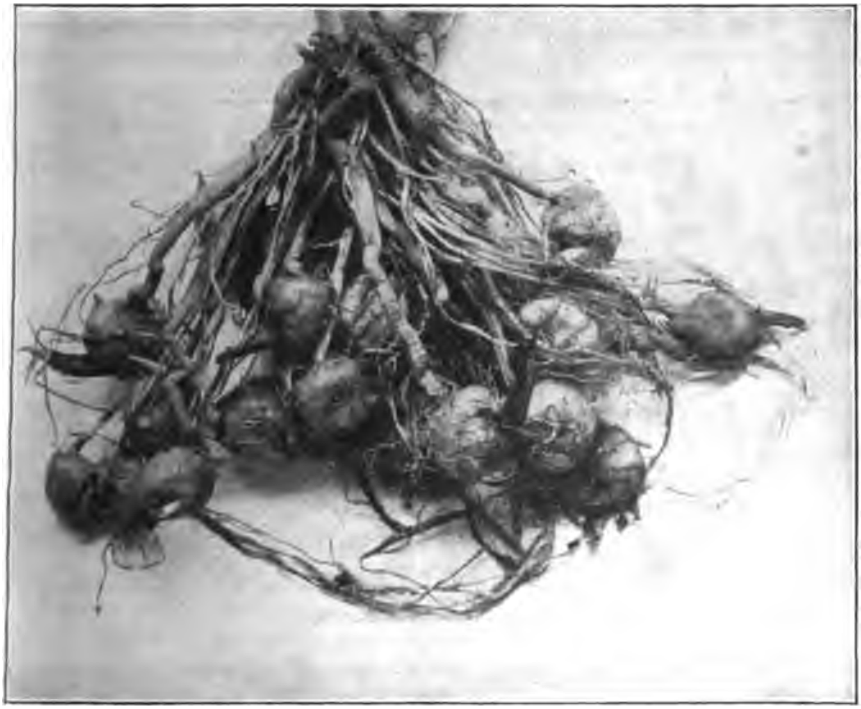

FIG. 21.—Tubers of delta potato. (About two-thirds natural size.)

PROPAGATION.

The delta potato undoubtedly can be propagated from seed, but, all things considered, transplanting the tubers is probably much the better method. This insures a large percentage of success, the plants will be larger, and as they will produce other tubers the first year they are much more valuable. Extraordinary precautions to prevent drying are not necessary, but the tubers should be kept cool and well exposed to the air to prevent heating or fermentation.

To plant, embed the tubers in mud bottom where the water is not more than a foot deep, preferably not more than 6 inches. It is better to err on the shallow side. The plant will grow thriftily on soil never covered by water but which has plenty of moisture. In such situations, however, the tubers are not available to ducks unless overflowed in winter. The delta potato is not injured by a slight quantity of salt in the soil. The plant is probably hardy anywhere in the southern half of the United States and may prove to be so farther north.

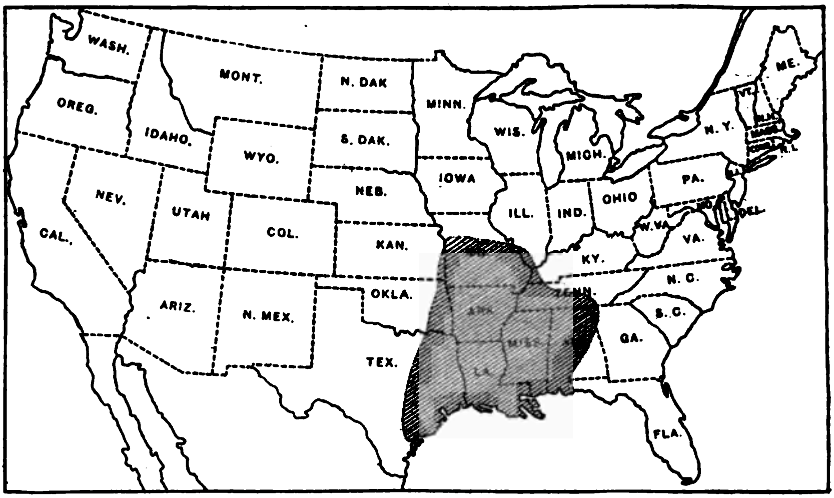

FIG. 22.—Range of delta potato.

WAPATO.

VALUE AS DUCK FOOD.

The tubers of the wapato (*Sagittaria latifolia* and *S. arifolia*) have been known to white men as an important food for wild fowl since the time of the Lewis and Clark expedition of 1804–6. These famous explorers state that in the Columbia River valley large numbers of ducks, geese, and swans occur where this plant is abundant and that the swans in particular feed extensively upon the plant. A correspondent of the Biological Survey, Mr. George W. Russell, of Gaston, Oreg., writes that the wapato is fed upon most by the diving ducks, as the canvas-back, redhead, and bluebills (scaups), and that they seek it whenever they are present in the country where it grows. Prof. David Dale Owen, in his report of a geological survey of Wisconsin, Iowa, and Minnesota, notes that these tubers afford much nourishment to the larger aquatic fowls. The vernacular names swan potato and duck potato that have been applied to these plants give further evidence of their value to wild fowl. Other local names are swamp potato, muskrat potato, Chinese onion, and water nut. The Biological Survey has found various parts of *Sagittaria* plants in stomachs of the following species of waterfowl: Mallard, widgeon, green-winged teal, blue-winged teal, spoonbill, pintail, canvas-back, little bluebill, ruddy duck, Canada goose, and whooping swan.

DESCRIPTION OF PLANT.

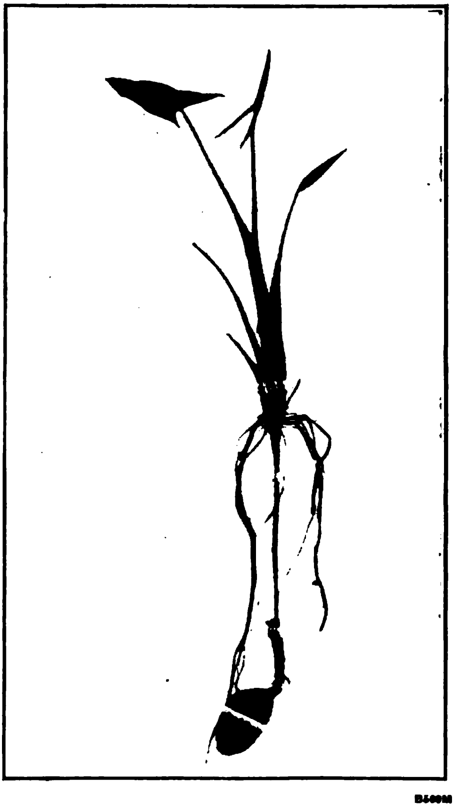

FIG. 23.—Young eastern plant of wapato with single tuber. (Two thirds natural size.)

The general relations of stems, flowers, and tubers are the same in the wapato (fig. 23) as in the delta potato, but the shape of the leaves is entirely different. Both *Sagittaria latifolia* and *S. arifolia* have arrowhead-shaped leaves. These vary greatly in the length, width, and shape of the point and barbs and in the degree of divergence of the latter. Various forms of leaves are illustrated in figure 24. The wapato plant sometimes reaches a height of 4 feet. The appearance of the flowers and seed balls is much the same as in the delta potato.

The tubers of *S. latifolia* (fig. 25), from six to nine to the plant, are formed on runners in the same manner as those of the delta potato, but they attain a much larger size. The largest specimen examined by the writer was 2 inches in its longest diameter and 1 inch thick. Including the bud and a short stalk at the base, the entire tuber may measure as much as 5 inches in length. The mature tubers of plants from the Northwest are more or less flattened, the shape being comparable to that of the ordinary edible crab. The smaller tubers are more nearly spherical (varying to ovoid), and this is the shape of even the largest tubers of eastern plants that the writer has seen. The sheaths of the tuber, being of a darker color than the body, are conspicuous.

DISTRIBUTION.

Sagittaria latifolia is found from the Atlantic coast to the Pacific, its range covering practically the whole United States (fig. 26). Areas from which it apparently has not been reported are peninsular Florida, the southern two-thirds of Louisiana and Texas, New Mexico, Arizona, and southern California. The northern limit of its range is marked by the following localities: Vancouver Island, Saskatchewan River, and southern Ontario and Quebec. *Sagittaria arifolia* is confined to States from Michigan and Kansas westward. Its range is largely included in that of *S. latifolia*, although it has been collected in New Mexico. The two species are distinguishable with certainty only upon the basis of mature seeds, and for all practical purposes may be considered as one.

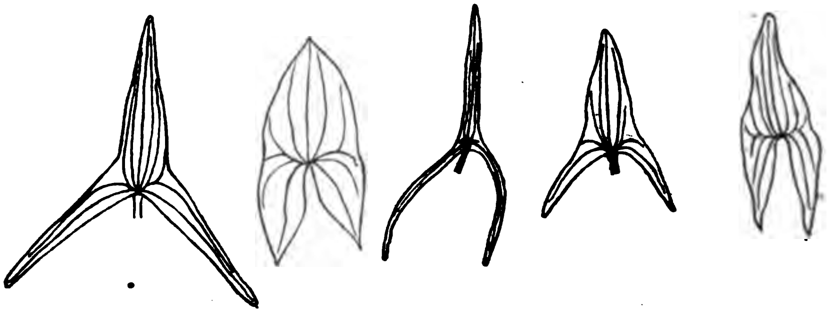

FIG. 24.—Various shapes of wapato leaves. (About one-tenth natural size.)

PROPAGATION.

The wapato may be transplanted by means of both seeds and tubers,[1] but the latter are the most reliable and give the quickest results. They may be set with the bud just beneath the surface in mud bottom under a foot of water or preferably less. The plants will grow in wet soil, but the tubers are not available for duck food in such places unless overflowed in fall and winter.

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[1] It is probable that tubers of *Sagittaria chinensis*, which are in market wherever there is a large Chinese colony, and which are also on sale by seedsmen, may be substituted for those of wapato with satisfactory results.

The tubers of this plant are known to retain their vitality when dried, but more uniform success will probably result if drying is not carried to an extreme. Tubers should be shipped promptly after gathering, in well-ventilated packages, and should be planted immediately upon receipt. The wapato is suitable for cultivation in practically all parts of the United States.

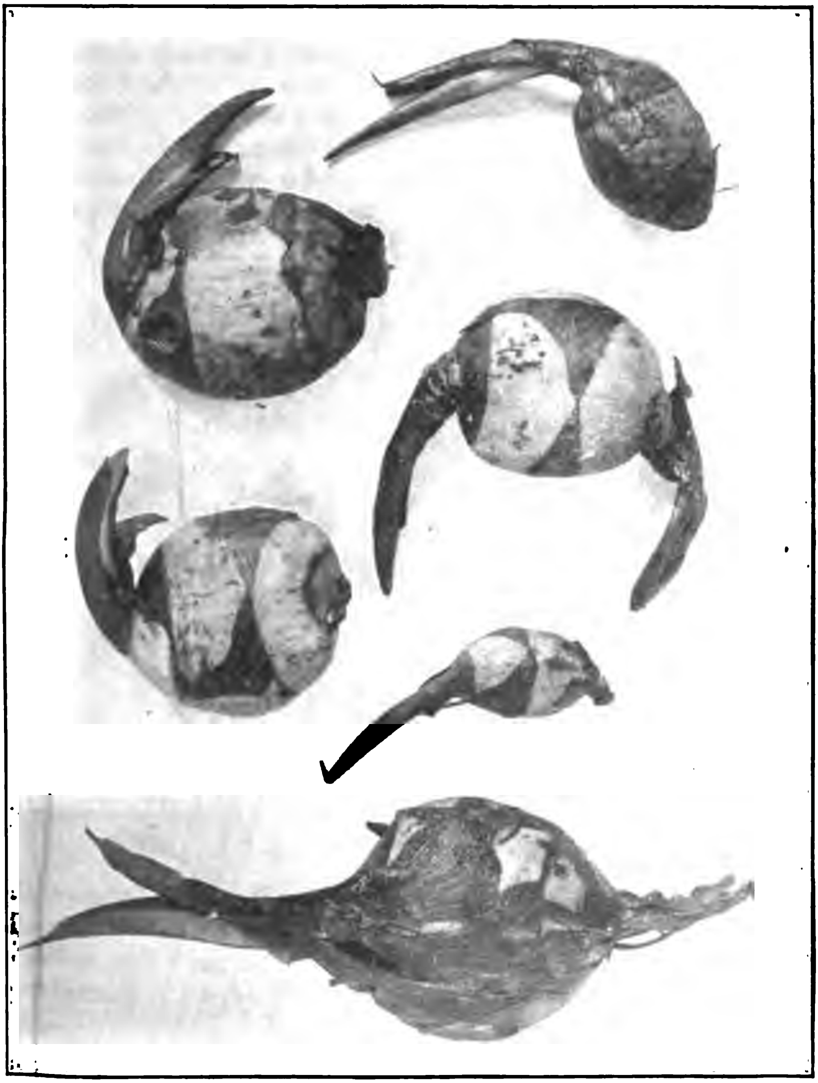

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FIG. 25.—Wapato tubers. (About two-thirds natural size.)

CHUFA.

VALUE AS DUCK FOOD.

Like some of the other duck foods mentioned in this bulletin, chufas (*Cyperus esculentus*) are at present known to be of only local importance. Those best acquainted with conditions at Big Lake, Ark., formerly one of the most famous hunting grounds of the South, now a national bird-reservation, believe that the chufa, or nut grass as it is there called, is the principal element in rendering that lake so attractive to waterfowl. Examination of stomachs from that locality seems to justify this belief. Six of a series of nine mallards collected at Big Lake in December, 1910, had fed on sedge tubers, the average percentage of which in the food of the nine was 56. Tubers of this species, or others of its genus, have been found also in duck stomachs from Florida, Illinois, Minnesota, and California. The species of ducks now known to feed on chufas are the wood duck, mottled duck, mallard, and canvas-back.

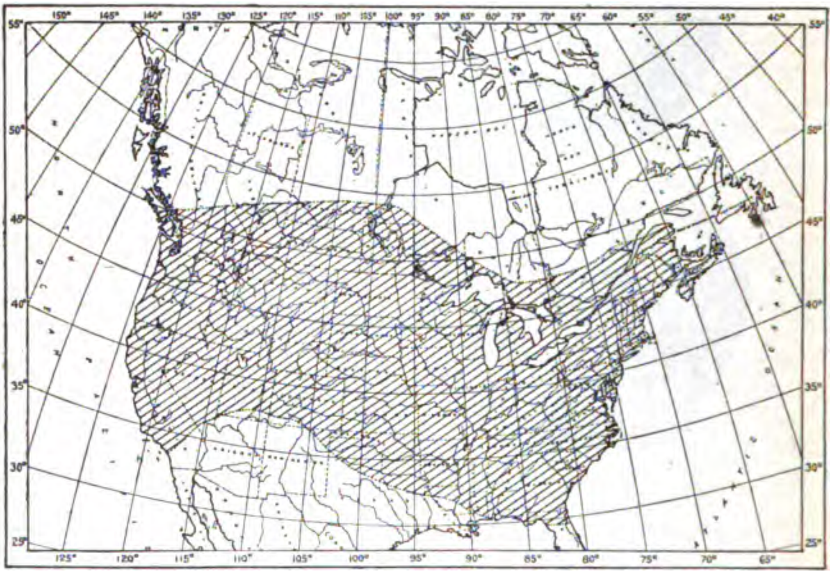

FIG. 26.—Range of the wapato.

DESCRIPTION OF PLANT.

The chufa (fig. 27) belongs to the group of plants known as sedges. These are grasslike and are usually classed with grasses by nonbotanists. Many of the sedges, however, including the chufa, have triangular, not round, stalks. The members of the genus *Cyperus* have a group of leaves at the base from which rises the stalk bearing the flowers and seeds. In the chufa these stalks are from 1 to 3 feet high. Several flower clusters on peduncles of varying length rise from the top of the stalk. From the same point three rather long, grasslike leaves project below the fruiting clusters.

Many members of the genus have a very similar appearance, and it is not likely that nonbotanical observers will distinguish them. This is unnecessary, however, as tubers of the chufa may be obtained for propagation from most seedsmen. The tubers are formed at the ends of scale-covered rootstocks. The plant is extremely prolific, cultivated forms usually producing 100 tubers to the plant, and instances are known in which more than 600 tubers were produced in one season from one tuber planted in spring.

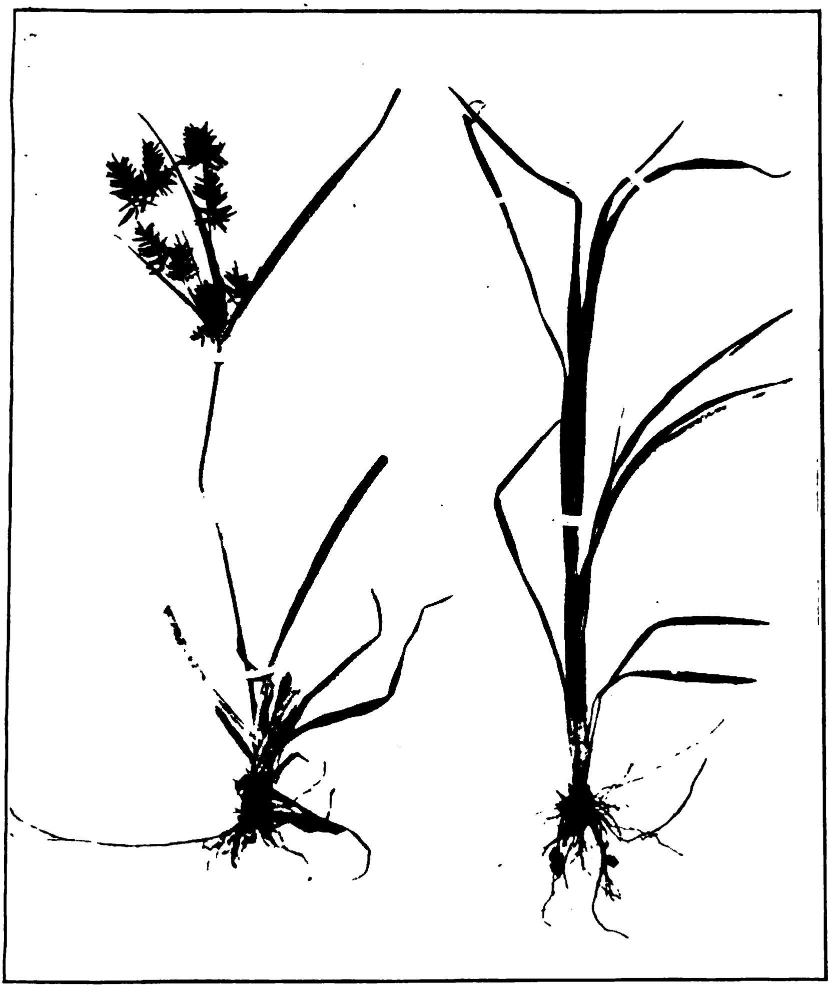

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FIG. 27 —Seed-bearing and immature plants of chufa. (Much reduced.)

Well-developed tubers of the cultivated variety average about three-fourths of an inch in length by three-eighths of an inch in diameter when dried. Tubers from wild plants are usually much smaller and have a greater proportion of fiber. The general appearance of chufas and of tubers from a wild sedge is well shown in figure 28.

Chufas are known also by the vernacular names earth almonds and ground nuts, and the plant as nut grass and cache-cache.

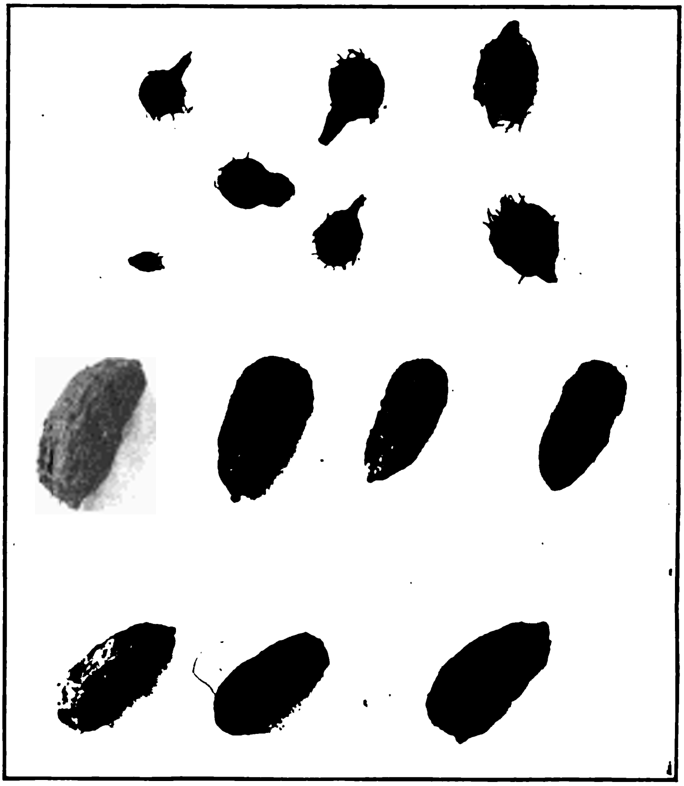

FIG. 28.—Tubers of wild and cultivated chufas. (Natural size.)

DISTRIBUTION.

The northern boundary of the natural range of the chufa is marked by the following localities: Southern New Brunswick, southern Ontario, northern Nebraska, New Mexico, Arizona, and the Columbia River valley. The plant seems to be absent from most of the Great Basin and Rocky Mountain regions. From its northern limit the plant ranges southward over the remainder of the continent. (See fig. 29.) It is widely distributed in warm climates over the entire world.

PROPAGATION.

Although the chufa seems not to grow naturally in a large area in western United States, there is no doubt that it can be cultivated everywhere except in the higher parts of the Rocky Mountain region. It is said to do fairly well at the altitude of Denver.

Chufas can be obtained from most seedsmen and are so cheap that it will pay sportsmen to buy new stock every few years, if earlier plantings show degeneration in size of tubers and hence reduction in value as duck food. Chufas do best on light or somewhat sandy but rich soils. They are available for duck food only when planted on land dry in summer and overflowed in winter. In the open they should be planted thickly so as to give the plants a better chance in competition with weeds. In timbered land they need not be planted so thickly, but they will do well in only rather sparse growths, where considerable light penetrates to the ground. When possible the land intended for planting should be broken up and freed from weeds. The tubers should be planted just beneath the surface in spring.

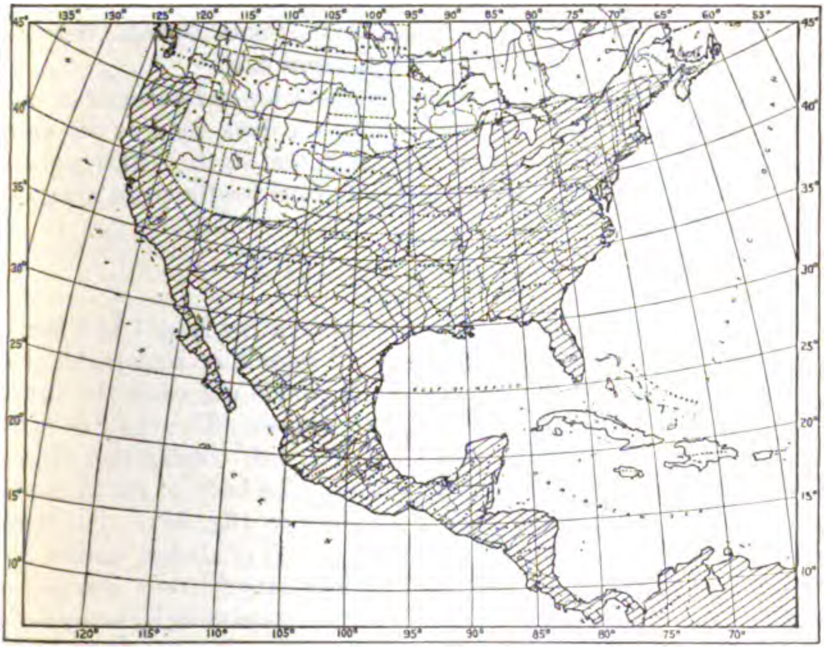

FIG. 29.—Range of the chufa.

WILD MILLET.

VALUE AS DUCK FOOD.

Wild millet (*Echinochloa crus-galli*) is an important food for ducks in widely separated regions of the United States. At Mud Lake, Ark., the writer found seeds of this plant to constitute more than 10 per cent of the food of 41 mallards collected; at Belle Isle, La., it made up more than half the food of the few mallards examined; and at Cameron, La., over 75 per cent of the diet of a collection of 50 ducks of the same species. Pintails, teal, and other shoal-water ducks are almost equally fond of it. Geese eat the stems and leaves of the plant, as do also ducks when they are hard pressed. Testimony as to the value of the plant as a wild-duck food has come from Wisconsin and Oregon, and the Biological Survey has found seeds of wild millet in duck stomachs from Massachusetts, South Dakota, Missouri, and Nebraska in addition to the States mentioned.

The plant is popularly known throughout lower Louisiana as wild rice and is given about the same rank as a duck food as the plant (*Zizania aquatica*) known by that name in the North. Other popular names referring to the preference of wild fowl for the plant are goose grass and blue-duck food.

DESCRIPTION OF PLANT.

Wild millet is a coarse, leafy grass which grows from 1 to 6 feet in height. The stems and foliage are not especially remarkable, but the fruiting head has characters which enable one easily to distinguish this from other species of native grasses. The chaff or outer seed covering is set with rows of short, stiff, outstanding spines. These project beyond the general outline of the body of the seeds and give them an easily visible spiny appearance (fig. 30). The inner scale of the chaff terminates in a spine which is always stouter and longer than the others. This spine or awn may be very short, or it may be from 2 to 3 inches or more in length, surpassing by many times the length of the seed. One of the other scales also may bear a long spine at the tip. The prickly character of the seed coverings is referred to in the name cockspur grass. The longer awns in particular, and sometimes the whole fruiting heads, may have a deep purplish color. This, no doubt, suggested the name blue-duck food used in the Mississippi Delta. The long-awned form has been given the varietal name *longearistata* but for present purposes we may consider all the types illustrated in figures 30 and 31 under the same name. It is probable also that the form named *Echinochloa walteri* is fully connected with *E. crus-galli* by intergrades and deserves only varietal rank. This form has the lower or all-leaf sheaths rough hispid.

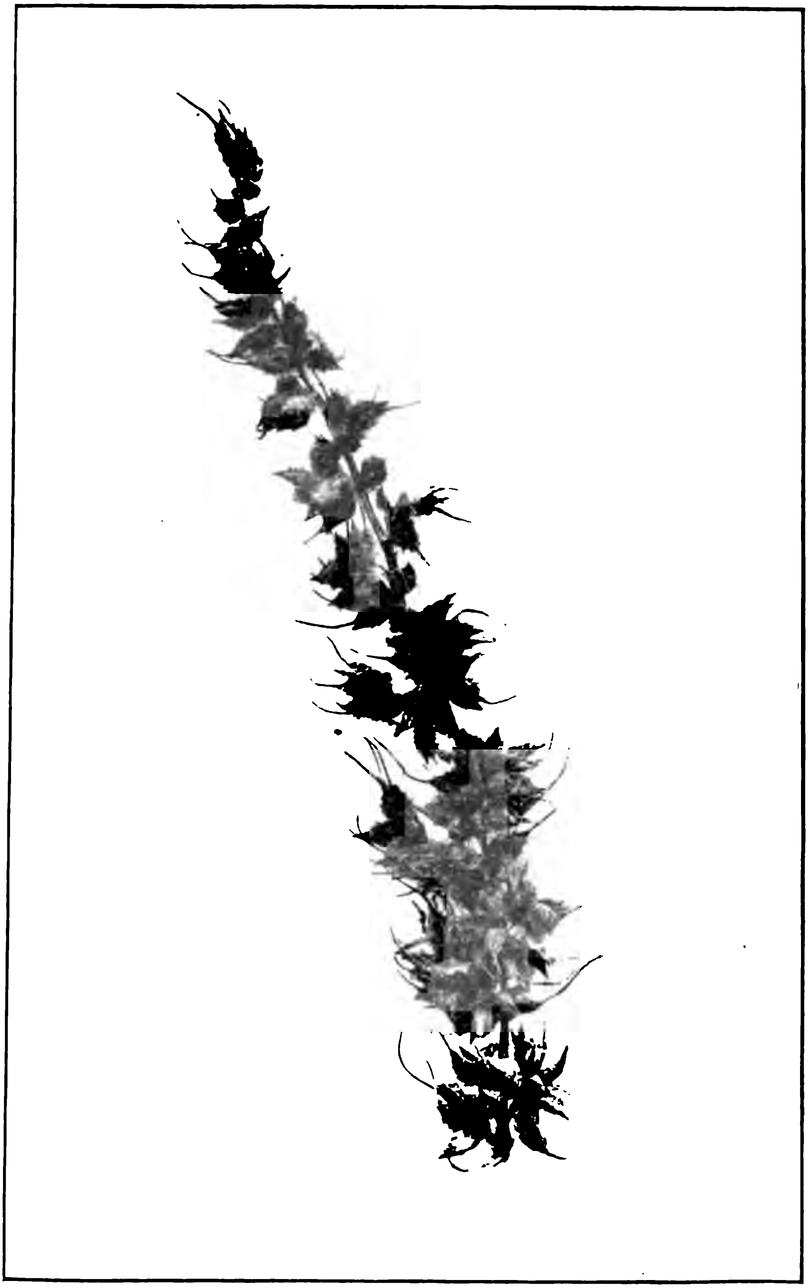

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Fig. 30.—Part of fruiting head of wild millet. (Natural size.)

DISTRIBUTION.

The northern limit of the range of wild millet so far as known does not much surpass the latitude of the northern boundary of the United States. From there the plant ranges indefinitely to the southward, occurring generally in rich moist soils or swamps at least to Central America.

PROPAGATION.

Wild millet is easily cultivated and reseeds itself. It requires a moist and preferably a rich soil, as the edge of a marsh or lake, and will grow in water at least a foot in depth. The soil should be broken up (mainly for the purpose of discouraging other plant growth) and the seeds sown thickly in spring. Once established, the plant will take care of itself. The nearer to water it is planted the more available will it be for duck food. It is a splendid plant to use for lowlands that are flooded in winter.

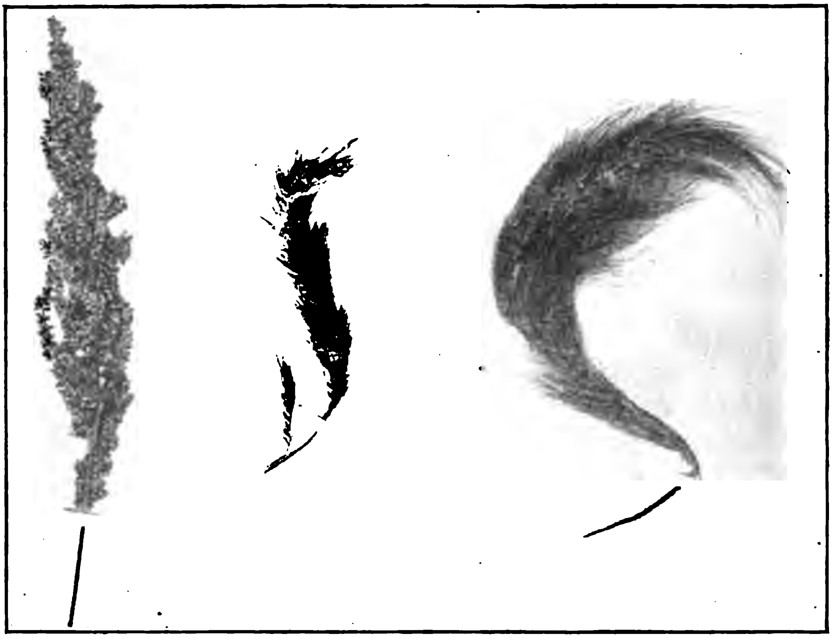

FIG. 31.—Fruiting heads of wild millet. (One-third natural size.)

The seeds are sold by most seedsmen under the name barnyard grass. A variety has been widely advertised as Japanese barnyard millet or billion-dollar grass. The plant is also known as cockspur grass and sour grass. It may be cultivated in any part of the United States having the proper soil conditions.

THE WATERLILY GROUP.

The waterlily group as represented in the United States is variously considered to comprise from one to three families. One of the three families (Cabombaceæ) is distinguished by having the seeds borne separately, each with its own closely fitting covering; these plants have small uncleft circular or oval leaves on central stalks. The second family (Nelumbonaceæ) has the large acornlike seeds in open cavities in a thick funnel-shaped receptacle; these plants have large uncleft circular leaves on central stalks. The third, or waterlily, family (Nympheaceæ) has the numerous seeds entirely inclosed in a fleshy, leathery, urn-shaped fruit; the leaves of these waterlilies are cleft from the edge to the point of attachment of the leaf stalk.

The Cabombaceæ include two plants of the United States, only one of which is known to have noteworthy value as a wild-duck food. This is the water shield (*Brasenia schreberi*, known also as *B. peltata*, and *B. purpurea*), which is found in ponds and slow streams throughout the United States. Other vernacular names for this plant are frogleaf and little waterlily. The seeds only are eaten, but they have been found in the stomachs of 19 species of ducks, including the wood duck, Florida duck, mallard, black duck, buffle-head, golden-eye, pintail, ruddy duck, widgeon, lesser and greater scaups or bluebills, redhead, ring-necked duck, canvas-back, green-winged and blue-winged teals, white-winged and surf scoters, and shoveller. No fewer than 120 seeds of water shield were found in a single stomach of a mallard, and 380 in one of a wood duck.

The family of nelumbos, or lotuses, has only one native species (*Nelumbo lutea*) in the United States, and it is locally distributed almost throughout the eastern half of the country. This plant has a variety of vernacular names, among which are water chinkapin, wankapin, yankapin, duck acorn, rattle or water nut, and yawknut, and, among the French-speaking people of Louisiana, vole and grand ovale. Locally it has considerable repute as a food for wild ducks, especially the wood duck.

The third, or waterlily, family consists of two genera, the cowlilies or spatterdocks (*Nymphæa*) and the true waterlilies (*Castalia*. The name *Nymphæa* long was applied to the latter group and is yet by some authorities. It is customarily used in this sense also in trade publications. The spatterdocks have yellow flowers with five or six leathery sepals, and the petals though numerous are inconspicuous. The waterlilies, on the other hand, have numerous conspicuous petals, which in our species are white, pink, blue-striped, blue, or yellow.

The spatterdocks, known also as pond, cow, toad, frog, dog, horse, or beaver lilies, beaver-root, and bonnets, are held to comprise 17 species distributed throughout North America, the best known of which is *Nymphæa* or *Nuphar advena*. These grow in shallow water of ponds or slow streams. Only the seeds have distinct value as wild-duck food. They have been found in stomachs of the mallard, black duck, pintail, green-winged teal, lesser scaup, and wood duck. No fewer than 160 seeds were in one stomach of the last-named species.

The true waterlilies of the United States belong to seven species. Among their vernacular names are pondlily, water cabbage, and alligator blankets. Seeds of these waterlilies are known to be eaten by the following 13 species of ducks: Wood duck, black duck, Florida duck, pintail, green-winged teal, lesser and greater scaups, redhead, ring-neck, canvas-back, widgeon, shoveller, and golden-eye. Large numbers of seeds found in single birds are 320 in a ring-neck duck, and 200 each in a lesser scaup and a ruddy duck.

PROPAGATION.

All the species of the waterlily group may be propagated either by seeds or rootstocks, and parts for propagating many of them are on the market. All grow in rather shallow, quiet, or slow-moving water, and prefer mucky bottom. The water chinkapin and the spatterdocks sometimes grow in water only a few inches deep, where the leaves and flower stalks stand erect. The true waterlilies, on the other hand, may grow in water six feet deep. The tuberous waterlily is especially valuable, because it will survive temporary drying up of the water body in which it grows. Probably the most valuable species of this group, however, is the banana waterlily, which is here treated in detail.

BANANA WATERLILY.

VALUE AS DUCK FOOD.

The writer has investigated the value of the banana waterlily (*Castalia mexicana*) as a food for wild ducks in only one locality—Lake Surprise, Tex. The proofs of its importance are so great, however, that they should be brought to the attention of American sportsmen. At Lake Surprise the banana waterlily alone made up nearly half of the entire food of the 10 vegetarian species of ducks occuring there at the time. This showing is much more significant from the fact that sago pondweed (*Potamogeton pectinatus*) also was abundant in the lake. The latter plant (see p. 17), in the writer's opinion, is the best all-round duck food in North America, yet at Lake Surprise it furnished somewhat less than 29 per cent of the food of the ducks, in comparison with more than 48 per cent supplied by *Castalia mexicana*.

Thirty-seven canvas-backs collected at Lake Surprise had eaten various parts of this plant to the extent of 71.6 per cent of their diet. This is a second illustration of the unusual phenomenon of the canvas-back's being attracted to shallow water by a highly prized food. Six ring-neck ducks, or blackjacks, made more than 91 per cent of their food of this plant, and two southern black ducks (*Anas fulvigula*) 98 per cent. The following ducks also were feeding on the plant: Mallard, pintail, lesser scaup, redhead, and shoveller. The parts eaten are the rootstocks, stolons, tubers, and seeds. Mr. Charles W. Ward has furnished rootstocks of *Castalia mexicana* from Avery Island, La., with the information that this plant and wild celery (*Vallisneria spiralis*) furnish the bulk of the food of canvas-backs in that locality.

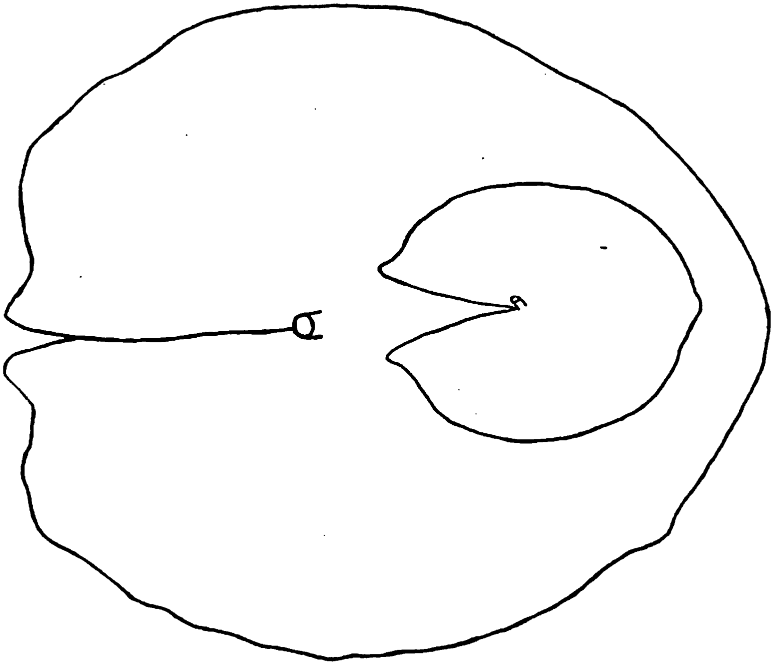

FIG. 32.—Two types of leaves of banana waterlily. (The larger outline half natural size.)

DESCRIPTION OF PLANT.

The banana waterlily is the only native species of the group of true waterlilies (as discussed above) that has yellow flowers. But the leaves and flowers of this species may either float on the surface of the water or stand a few inches above it. The leaves are green above with brown mottlings and vary from greenish to purplish red below with small black markings. The edges of the cleft of the leaf are either somewhat separated or overlapping (fig. 32). The plant springs from an upright rootstock (fig. 33) which bears some resemblance to an unopened pine cone. The rootstocks vary in size up to 2 inches thick and 12 inches long. The smaller ones (at least up to 1¾ inches long by three-fourths of an inch thick) are swallowed by ducks.

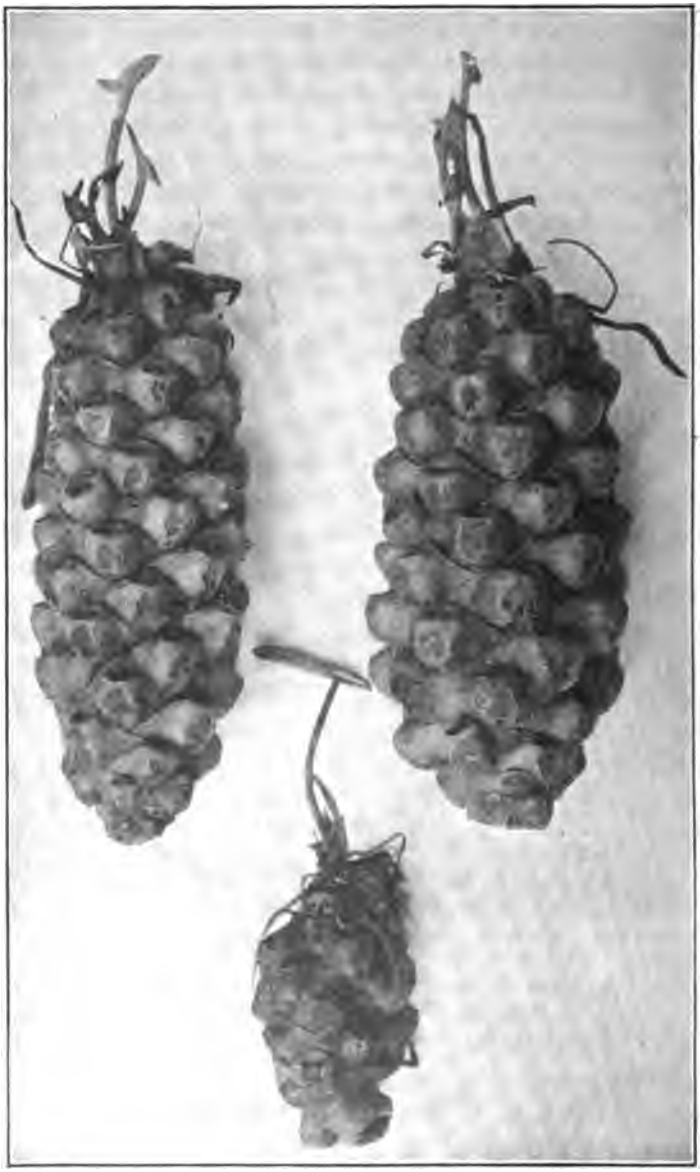

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FIG. 33.—Small rootstocks of banana waterlily. (Natural size.)

Tender white stolons or runners extend in various directions from the rootstock. These runners are from a quarter to half an inch in diameter. During the active growing season they give rise to new plants, but in autumn they form peculiar hibernating bodies. These consist of the short modified tip of the stolon, which bears several (1 to 7) upwardly directed buds on one side and a cluster (2 to 17) of thick tuberlike roots on the other. The appearance of these (fig. 34) is strongly suggestive of a miniature "hand" of bananas, and for this reason the name banana waterlily has been proposed for this plant, which has no distinctive vernacular appellation. The name has the additional merit of suggesting the yellow color of the tubers and of the flowers.

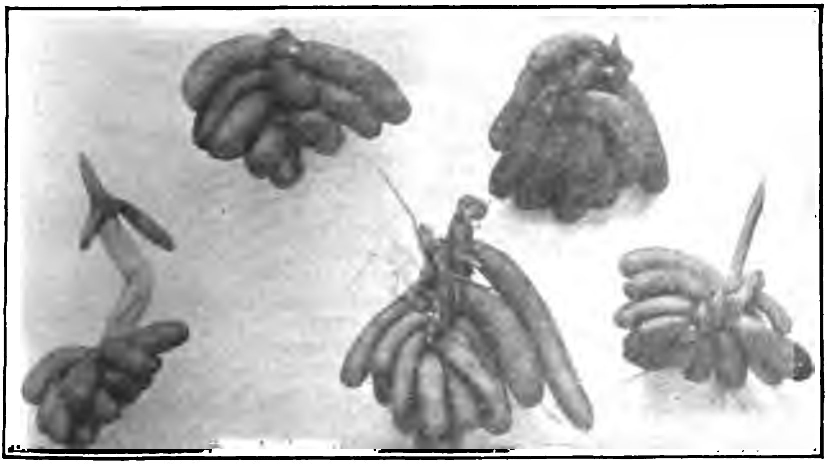
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FIG. 34.—Hibernating bodies of banana waterlily. (Two-thirds natural size.)

DISTRIBUTION.

The banana waterlily has been known chiefly as a native of Florida, and the plants of that State have long gone under the name *Castalia flava.* Plants identified from a few localities in Mexico and from Brownsville, Tex., have been called *C. mexicana.* Dr. H. S. Conard, who has monographed the genus,[1] unites these species, as he is fully justified in doing, on the basis of their possession in common of characters unique among waterlilies. The new records of the plant from Galveston, Tex., and Avery Island, La., go far toward bridging the previous apparent gap in distribution of the plant and toward corroborating Dr. Conard's views. The accompanying map (fig. 35) shows the probable natural range of the species along the Gulf coast and in Mexico.

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[1] Publication No. 4, Carnegie Institution, 1905.

PROPAGATION.

Although the banana waterlily is native to only a small portion of the United States, it can be successfully grown over practically the whole country. The plant has long been familiar in cultivation and is sold by most dealers in ornamental aquatics. The waterlily expert of one of the largest firms in the United States reports that *Castalia mexicana* is perfectly hardy as far north as New York City when covered with a foot of water, and he believes that if covered with 2 feet of water it would be hardy at Boston.

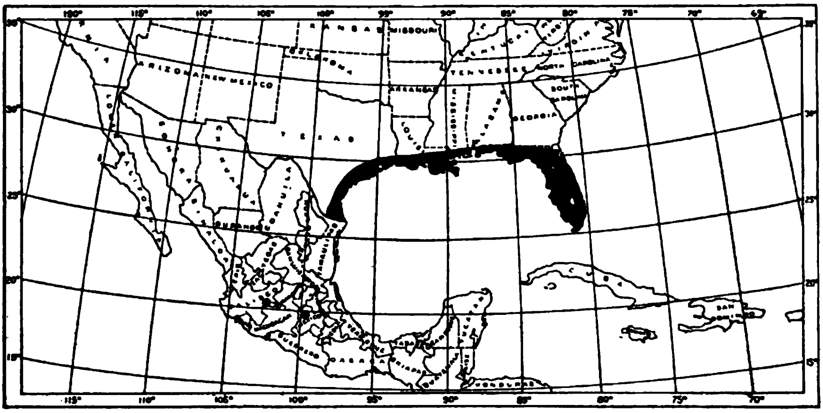

FIG. 35.—Range of banana waterlily.

The banana waterlily needs an abundance of sunlight, water from 1 to 3 feet deep,[1] and a mud bottom. It is not injured by a trace of salt, as is shown by its growing in lakes very near the coast. The rootstocks may be planted by weighting them with stones and dropping where desired. Having great vitality, they may be shipped with only moderate precautions to prevent them from drying, and may be transplanted at almost any time of the year.

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[1] When established it will spread to places where the water is even 5 feet deep.

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U. S. DEPARTMENT OF AGRICULTURE

BIOLOGICAL SURVEY—BULLETIN No. 26

C. HART MERRIAM, *Chief*

DISTRIBUTION AND MIGRATION OF NORTH AMERICAN DUCKS, GEESE, AND SWANS

BY

WELLS W. COOKE
Assistant, Biological Survey

WASHINGTON
GOVERNMENT PRINTING OFFICE
1906

LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Biological Survey,
Washington, D. C., July 10, 1906.

Sir: I have the honor to transmit herewith, for publication as Bulletin No. 26 of the Biological Survey, a report on the Distribution and Migration of North American Ducks, Geese, and Swans, by Wells W. Cooke, assistant in the Biological Survey. Formerly abundant over the whole of the United States, waterfowl are steadily diminishing in numbers, and some species appear to be threatened with extinction in the not distant future. Their value for food is great, and they have formed in the past, and for all future time should continue to form, a valuable asset and an important source of revenue to the several States which harbor them. The preservation of the numerous species of ducks, geese, and swans is becoming an important matter of legislative enactment, and the present report is intended to furnish information as to present range, abundance, and migration of the several species with reference to practical legislation.

Respectfully,

H. W. Henshaw,
Acting Chief, Biological Survey.

Hon. James Wilson,
Secretary of Agriculture.

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DISTRIBUTION AND MIGRATION OF NORTH AMERICAN DUCKS, GEESE, AND SWANS.

INTRODUCTION.

Wild fowl are distributed over the whole world. From time immemorial ducks, geese, and swans have been held in high esteem by mankind, and everywhere they have been eagerly pursued for sport or for food.

Passing by the purely esthetic value of the birds as beautiful and welcome denizens of our waters and as lending the charm of life and animation to our otherwise desolate ponds and lakes; passing by, too, their importance to thousands of men who are lured from business cares to pursue them and who derive from their pursuit both health and pleasure, their economic value and importance as food are very great. The flesh not only is palatable and nutritious, but is so different from that of domestic fowls as to form a most welcome addition to the table both of the rich and the poor.

The flesh of wild fowl constituted an important item in the larder of the aborigines of this country, who, by means of the bow and arrow and by the use of various devices in the shape of nets and traps, succeeded in obtaining them in considerable numbers, especially when young and unable to fly. The Eskimo and northern Indians, indeed, would fare badly but for the vast numbers of waterfowl that visit their country to breed, and everywhere the aborigines seek their eggs with avidity. Waterfowl as an addition to the larder became almost as essential to the first settlers as they had been to the Indians, and, so far as game was concerned, the fowling piece soon became a more important part of the settler's equipment than the rifle.

Neither the aborigines nor the early settlers appreciably reduced the numbers of the hordes of ducks and geese that periodically covered the lakes, ponds, rivers, and marshes of this favored country. It was not until comparatively recent times, indeed, that the tremendous increase of population and the constantly increasing number both of sportsmen and of market gunners, together with the invention of that potent engine of destruction, the breech-loading gun, have had their logical effect in greatly diminishing their numbers and in practically exterminating not a few species.

So rapidly are some species diminishing in numbers in certain States that the market supply is already threatened, and Minnesota has found it necessary to pass laws prohibiting not only the export of ducks, but even their sale within the State limits. Such radical legislation in a State where only a few years since waterfowl abounded on every lake and waterway, reveals how imminent is the danger and how pressing the value and importance of prohibitive laws, and it becomes evident that if any considerable number of waterfowl are to be preserved, spring shooting must be abolished and the sale of wild fowl limited to the States where killed.

The enforcement of moderately stringent protective laws, however, and the establishment of preserves in the States where waterfowl can be sure of shelter and safety, are likely to result not only in averting the threatened extinction of certain species, but in the increase of all waterfowl to a point somewhere near their recent abundance. Should the lessons of the past be unheeded and protection be withheld for a few years, then measures of the most radical kind will be necessary.

Of the 64 species and subspecies of ducks, geese, and swans which occur in North America north of Mexico, 24 breed in the United States. The species most important to us are the wood duck, mallard, black duck, teal, canvasback, redhead, and Canada goose. Several of these species breed only in the Northern States; but the cinnamon teal and ruddy duck nest as far south as southern California, and the wood duck breeds almost everywhere throughout the United States, and, moreover, the great bulk of this species winters within our boundaries.

It is a sad commentary on our present system of game protection that the wood duck, one of the handsomest of our native birds and one whose breeding range is almost entirely within our boundaries, is the species which has suffered most. So persistently has this duck been pursued that in some sections it has been practically exterminated. Even in States in which it still breeds commonly, as in Delaware and Maryland on the Atlantic coast and in Illinois in the Mississippi Valley, public sentiment fails to recognize the importance of adequately protecting the bird, and the laws still permit it to be destroyed late in the spring. As a result the wood duck is constantly diminishing in numbers, and soon is likely to be known only from books or by tradition.

PROTECTION.

Wherever waterfowl already breed, or where the conditions are such as to favor their remaining during the summer, every effort should be made to increase the number of breeding birds by adequate protection both in the spring and during the nesting season, and, wherever possible, game refuges or preserves suitable for breeding purposes should be established.

Protective laws intended to shorten the open seasons, to prohibit spring shooting, eliminate destructive methods of hunting, and to stop sale and export have often provoked opposition from those who maintain that it is futile to attempt the protection of migratory birds in the North if they are not equally well protected on their winter feeding grounds in the South.

Recent experience, however, shows that under certain circumstances the results of local protection are immediate and very striking. In the San Luis Valley, Colorado, protection afforded ducks within an inclosure about an artificial pond, fed by an artesian well, has caused the birds to resort to the pond in increasing numbers each winter. At Palm Beach, Fla., where no hunting is allowed within a mile of the town, ducks have become so tame that they will come within a few feet for food, while outside the mile limit the same birds are so wild that it is difficult to approach them within gunshot. In Jefferson County, N. Y., the enactment of a local law prohibiting spring shooting has resulted in several species remaining to breed which formerly went much farther north to lay their eggs, when continually harassed by constant hunting in the spring. The enactment of a State law in New York prohibiting the shooting and sale of ducks and geese in spring has not only had a marked effect on local birds, but has resulted also in extending protection to waterfowl in North Carolina by restricting in the latter State their slaughter for the markets of New York City.

These and other illustrations which might readily be cited show that, if protected, many species that formerly reared their young in the United States, and were driven away by persecution, would return and occupy old breeding grounds. They prove also that very effective work for the protection and increase of waterfowl can be done in many sections of the country without waiting for general legislation or for concerted action on the part of the Southern States. Cooperative legislation on the part of the Southern States is greatly to be desired and may be expected to follow as the causes that have led to the diminution in the numbers of waterfowl are better understood there and as the purpose and effects of protective legislation in Northern States are fully comprehended.

With reference to practical legislation in behalf of wild fowl, questions often arise as to the time when various species may be expected at certain points in the autumn, when they leave for their breeding grounds in the spring, how late in the season shooting can be continued without interfering with pairing, what progress in legislation has been made in different parts of the United States, and what have been the practical results of such legislation.

In order to enable the Department to answer such inquiries, a comprehensive investigation of the general facts relating to our wild fowl has been undertaken. In the present report are presented such data as are now available respecting the distribution and migration of the ducks, geese, brant, and swans of North America, together with a brief reference to a few species which occur in Panama and the West Indies. A summary is also given of existing information as to the breeding grounds occupied by the several species, their winter resorts, the routes selected in passing north and south, and the times of making their journeys. Other subjects of investigation still under way are the food habits of the various species, principal ducking grounds, methods of hunting, and the means which have thus far proved most successful in the protection of these birds.

The problem of the legal protection of ducks, geese, and swans has two phases—protection during the breeding season and protection during migration and in winter. The first phase concerns 24 species of ducks breeding in the United States, while 46 species come under the head of winter residents of the United States. It happens, however, that from the economic point of view the 24 species of ducks and geese that breed in the United States comprise the most important North American species; among this number also are all the species that at the present time need protection while breeding. Of the 24 species, 5 are numerically unimportant and are confined to the southern portions of the United States and southward, so that they are of little importance for the market and as objects of sport. These 5 are the Florida duck, mottled duck, masked duck, black-bellied tree-duck, and fulvous tree-duck.

The other 19 species that breed regularly and commonly in the United States are as follows:

American merganser, *Merganser americanus.*
Hooded merganser, *Lophodytes cucullatus.*
Mallard, *Anas boschas.*
Black duck, *Anas obscura.*
Gadwall, *Chaulelasmus streperus.*
Baldpate, *Mareca americana.*
Green-winged teal, *Nettion carolinense.*
Blue-winged teal, *Querquedula discors.*
Cinnamon teal, *Querquedula cyanoptera.*
Shoveler, *Spatula clypeata.*
Pintail, *Dafila acuta.*
Wood duck, *Aix sponsa.*
Redhead, *Aythya americana.*
Canvasback, *Aythya vallisneria.*
Lesser scaup, *Aythya affinis.*
Ring-necked duck, *Aythya collaris.*
Ruddy duck, *Erismatura jamaicensis.*
Canada goose, *Branta canadensis.*
White-cheeked goose, *Branta canadensis occidentalis.*

A glance shows that this list comprises the species that in later years have decreased most in numbers, and hence that most need protection.

CAUSES OF DECREASE IN NUMBERS OF WATERFOWL.

The principal causes of the diminished numbers of waterfowl have been market hunting, spring shooting, and the destruction of the breeding grounds for farming purposes. Previous to twenty years ago, market hunting was the principal factor in the steady diminution of waterfowl. Since 1885, however, the problem of duck preservation in North America has entirely changed. The prairie districts of central Canada, comprising large portions of Manitoba, Saskatchewan, and Alberta are the "ducks' paradise." Within the United States this favored region extends to the northeastern part of Montana, the northern half of North Dakota, and the northwestern corner of Minnesota. The whole vast region is crowded with lakes, ponds, sloughs, and marshes that furnish ideal nesting conditions and unlimited food. Forty years ago every available nook was crowded with waterfowl, and the whole region, 200 miles wide by 400 miles in length, was a great breeding colony, and numbered its inhabitants by the hundreds of thousands. To the northward the forests formed a partial boundary; to the southward, the general absence of suitable breeding grounds was the controlling factor, restricting the breeding waterfowl to the few lakes and marshes. The number of breeding ducks decreased rapidly from central North Dakota southward, until the outposts were reached in the lake region of southern Wisconsin, the Kankakee marshes of Illinois and Indiana, a few favored spots in southwestern Minnesota, and the lakes of north-central Iowa. In southern Wisconsin in 1864, every pond hole and every damp depression had its brood of young ducks. During the next fifteen years the farming of the region changed from grain raising to dairying, the marshes were drained, the former duck nurseries became grazing grounds, and duck hunting there was a sport of the past.

An article written in 1877 on the birds of northeastern Illinois enumerates 12 species of ducks as breeding commonly in the vicinity and 3 others as occasionally found there in summer. At present, a brood of young ducks in this region is rare. In 1885 some 14 species bred near Clear Lake, Iowa, and 16 species at Heron Lake, Minnesota. Now scarcely any ducks breed at either lake. But the places just mentioned were merely the outskirts of the "ducks' paradise." As great a change has taken place in the very heart of the breeding grounds. The Northern Pacific Railroad cut across its southern border in Minnesota and North Dakota and this was soon followed by a north and south line to Winnipeg. Other shorter branches were built later, but the final doom of the ducks was apparent when the Canadian Pacific Railroad crossed between Winnipeg and the Rocky Mountains the finest duck breeding grounds on the continent. During the past decade, the last stronghold of the waterfowl has been invaded, and soon the great breeding colonies of northern Alberta and Saskatchewan will be of the past. The population of North Dakota increased many fold from 1880 to 1900, and during this same period the vast prairies of central Canada were changed to wheat fields. It is evident, therefore, that in the United States and southern Canada in a few years there will be no great breeding colonies of the ducks most valued for sport and for the table. The future supply must come from isolated pairs and small colonies scattered in favorable localities over Canada and the northern quarter of the United States. Fortunately, such favorable places exist and will continue to exist for many years.

An important question in connection with the protection of ducks is the time when they pair for the breeding season, since it is evident that if shooting is continued after the birds are paired a decided decrease in the number of broods will result. While the present state of knowledge does not warrant positive statements as to the exact date of pairing of each species, enough has been learned to show that in the case of many species pairing occurs before the breeding grounds are reached. Many if not most of the mallards and shovelers that pass through Illinois on their way to more northern breeding grounds are paired before they leave that State, and the same is true of these species in Iowa. Many black ducks, wood ducks, and teal are paired in the spring by the time they reach Massachusetts. The following letter from Hon. John E. Thayer is of interest in this connection:

> I am absolutely positive that mallards, black ducks, gadwalls, widgeons, green-winged and blue-winged teal, shovelers, and pintails begin mating at Currituck Sound, North Carolina, by February 15. By the 1st of March they are mated. The law should protect them then, for if one is shot, the other will keep flying about until within easy range. There is not a shadow of doubt that the ducks I have named are mated before they migrate, and if we do not want to exterminate them, laws should protect them from the time they leave the South.

Above have been outlined the causes, past and present, of the great diminution in the numbers of the ducks. The practical problem of to-day is the present and future preservation of the remnant. It goes without saying that all ducks should be protected during the breeding season. Notes in the following pages under the different species show the dates at which the earliest eggs have been found, and from these dates it is easy to determine the beginning of the breeding season. The wood duck, in northern Florida, begins nesting by the middle of February and the black duck, in Massachusetts, by April 20. It follows, therefore, that at the very latest these ducks should not be disturbed in Florida after February nor in Massachusetts after April 1. These dates apply to corresponding latitudes in the Mississippi Valley, and the 1st of May would be the latest date for Minnesota and North Dakota. On the Pacific slope the corresponding nesting dates are from late March in southern California to late April in the State of Washington.

Protection during the breeding season is the least that any friend of the ducks would advise. The present rapid diminution in the number of waterfowl can not be stayed, however, by such partial measures. Nothing short of the absolute prohibition of spring shooting in every part of the country should be advocated by those who believe that duck shooting should be enjoyed by future generations.

Another phase of protection relates to the proper regulation of shooting during the fall and winter. This phase concerns a much larger number of species of waterfowl than the question of hunting during the breeding season. For although only 24 species nest within the United States, 46 species are found here during winter, as will appear from the following lists:

WINTER RANGES.

Species that Winter Principally in the United States and Southward.

Hooded merganser,[a] *Lophodytes cucullatus.*
Mallard, *Anas boschas* (on the Pacific coast to the Aleutian Islands).
Black duck, *Anas obscura.*
Red-legged duck, *Anas obscura rubripes* (occasional in winter in Nova Scotia).
Florida duck, *Anas fulvigula.*
Spotted black duck, *Anas fulvigula maculosa.*
Gadwall, *Chaulelasmus streperus.*
Baldpate,[a] *Mareca americana.*
Green-winged teal, *Nettion carolinense.*
Blue-winged teal,[a] *Querquedula discors.*
Shoveler,[a] *Spatula clypeata.*
Pintail,[a] *Dafila acuta.*
Wood duck,[a] *Aix sponsa.*
Redhead,[a] *Aythya americana.*
Canvasback,[a] *Aythya vallisneria.*
Scaup duck. *Aythya marila* (rare in southern Canada and on the Pacific coast to the Aleutians).
Lesser scaup duck,[a] *Aythya affinis.*
Ring-necked duck,[a] *Aythya collaris.*
American golden-eye, *Clangula clangula americana* (rare in southern Canada, and on the Pacific coast to the Aleutians).
Buffle-head, *Charitonetta albeola* (on the Pacific coast to the Aleutians).
Ruddy duck,[a] *Erismatura jamaicensis.*
Lesser snow goose,[a] *Chen hyperborea.*
Greater snow goose, *Chen hyperborea nivalis.*
Blue goose, *Chen cærulescens.*
Ross goose, *Chen rossii.*
American white-fronted goose, *Anser albifrons gambeli.*
Canada goose,[a] *Branta canadensis.*
Hutchins goose,[a] *Branta canadensis hutchinsii.*
White-cheeked goose, *Branta canadensis occidentalis.*
Cackling goose,[a] *Branta canadensis minima.*
Brant, *Branta bernicla glaucogastra.*
Black brant, *Branta nigricans.*
Fulvous tree-duck, *Dendrocygna fulva.*
Whistling swan,[a] *Olor columbianus.*
Trumpeter swan,[a] *Olor buccinator.*

Species that Winter in the United States and Canada.

American merganser, *Merganser americanus.*
Red-breasted merganser, *Merganser serrator.*
Barrow golden-eye, *Clangula islandica.*
Old squaw, *Harelda hyemalis.*
Harlequin duck, *Histrionicus histrionicus.*
American eider, *Somateria dresseri.*
Spectacled eider, *Somateria spectabilis.*
American scoter, *Oidemia americana.*
White-winged scoter, *Oidemia deglandi.*
Surf scoter, *Oidemia perspicillata.*

If ducks are to be protected for reasons other than esthetic, there must be an open season. Most will agree that so far as the perpetuation of species alone is concerned this open season should be during migration, and preferably during the fall migration. The data presented later in this bulletin show that ducks begin to leave their breeding grounds late in August, but that active migration does not occur until September. A shooting season in northern New England or the northern portion of the Mississippi Valley that began September 1 would satisfy the demands of conservative sportsmen of these sections. In the southern United States, however, this date would anticipate by a full month the time when enough ducks arrive to make hunting worth while, and at Currituck Sound, North Carolina, shooting does not begin until November.

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[a] Winters also in southern British Columbia.

In the northern half of the United States the great body of ducks and geese depart with the advent of freezing weather, and but few linger after early November. On the other hand, south of the Ohio River and Chesapeake Bay the ducks and geese remain all winter, and, unless protected, will be harassed throughout the entire cold season. The greatest slaughter of ducks now occurs in the section named, especially in the Mississippi Valley from southern Missouri southward, and here more stringent laws are needed. It is claimed above that the shooting season should be confined to the period of migration, and if this is true then it follows that fall shooting should cease as soon as, or soon after, fall migration has ceased. Regular migration has closed by the first of December, and though the birds are constantly shifting their position all through the winter as the weather changes, these movements can hardly be called migration.

MIGRATION.

Ducks, geese, and swans are migratory. While many breed under the torrid sun of the Tropics, others migrate to the most distant parts of the world for the purpose of nesting. As far into the frozen north as land extends geese summer and successfully rear their young.

A few species are nonmigratory, and individuals of other species, as the ruddy duck, remain through the year near the nesting grounds; but most of the ducks and geese are strictly migratory and some perform extensive journeys. The brant of northern Greenland, for instance, probably spend the winter along the South Atlantic coast of the United States. Some of the blue-winged teal that nest in southern Canada desert North America in fall and cross the equator to spend the winter in central South America. Some of the pintail ducks of Alaska and northeastern Asia cross the equator to the islands of the South Pacific, 4,000 miles from their breeding grounds.

Most waterfowl, in migrating, follow the same route both in spring and fall. The ducks that migrate north along the Mississippi River in spring probably are the same individuals that traversed this route the previous autumn. Among the geese there is a single exception to this rule. The common eastern brant (*Branta bernicla glaucogastra*) in spring passes north along the Atlantic coast to the Gulf of Saint

Lawrence, thence almost due north for 2,000 miles to its breeding grounds, but it is practically unknown in the interior of Canada. In the fall many thousands migrate along the west shore of Hudson Bay and from its southern borders cross to the Atlantic coast. Thus the migration route is in the form of an ellipse some 3,000 miles long north and south by 1,000 miles wide.

Probably in no other region in the world do so large a proportion of the birds migrate approximately north and south as in North America north of the Gulf of Mexico. The outlines of the coast, the courses of the large rivers, and the trend of the mountain chains unite to make northward and southward migration easy and natural. In the case of ducks, however, there is a factor that causes thousands of individuals of several species to take a northwest-and-southeast route. The Atlantic coast from Chesapeake Bay to South Carolina is especially favorable as a winter home for ducks and until recent years countless flocks swarmed throughout this district. Such other birds as winter in this region breed principally in New England and northward along the Atlantic slope to Labrador. But northeastern North America east of Hudson Bay harbors only a small number of ducks in summer. They prefer the marshes, lakes, and streams of the districts west of Hudson Bay, and the great bulk of North American ducks breed there. Thus there are two great districts, one suitable for a summer home and the other for winter, and the migration route between them is nearly northwest and southeast, between Chesapeake Bay and Great Slave Lake. Through much of the intervening 2,000 miles is a succession of lakes, large and small, that find no counterpart elsewhere on this hemisphere, and which furnish ideal conditions for ducks, both as regards food and shelter.

Among the most conspicuous species that follow this migration route are the redhead, canvasback, and greater scaup. Less abundant, though still numerous, are the baldpate, pintail, and lesser scaup, while the route is extensively used also by the mallard, gadwall, shoveler, and ring-necked duck. Nearly all the individuals of these 10 species that winter along the Atlantic coast reach their winter home by a pronounced southeastward migration, though it must be understood that these individuals constitute only a small percentage of the vast army of these same species that breed in central Canada.

One of the principal winter homes of North American ducks and geese is the State of California, where congregates during this season the larger part of all the individuals that breed west of the Rocky Mountains.

DISTRIBUTION.

The family of ducks, geese, and swans is represented in North America by 63 species and 8 subspecies—a total of 71 recognized forms; but the following 7 of these do not range so far north as the United States:

Species occurring in Central America, West Indies, or Mexico, but not known to reach the United States.

Muscovy duck, *Cairina moschata.*
Diaz duck, *Anas diazi.*
Abert duck, *Anas aberti.*
Bahama duck, *Pœcilonetta bahamensis.*
White-faced tree-duck, *Dendrocygna viduata.*
Whistling duck, *Dendrocygna arborea.*
Southern red-billed tree-duck, *Dendrocygna discolor.*

There remain 64 species and subspecies that occur in the United States and northward, but 11 of these are only accidental in North America. One of them, *Mareca penelope*, has been recorded about 80 times in various parts of the United States, Canada, and Greenland. *Nettion crecca* has been captured about twenty times in the same regions. *Netta rufina* has been found only once—in New York market. The other 7 occur more or less regularly in Greenland, but are not known on the mainland of North America. These 11 species are:

European Species occurring in North America as Stragglers.

European smew, *Mergus albellus.*
Widgeon,[a] *Mareca penelope.*
European teal,[a] *Nettion crecca.*
Ruddy sheldrake, *Casarca casarca.*
Rufous-crested duck, *Netta rufina.*
Velvet scoter, *Oidemia fusca.*
White-fronted goose, *Anser albifrons.*
Bean goose, *Anser fabalis.*
Brant, *Branta bernicla.*
Barnacle goose, *Branta leucopsis.*
Whooping swan, *Olor cygnus.*

Four species of eider ducks and the emperor goose are so decidedly boreal that they do not come south to the United States even in winter. These are:

Species that Breed and Winter North of the United States.

Steller eider, *Polysticta stelleri.*
Spectacled eider, *Arctonetta fischeri.*
Northern eider, *Somateria mollissima borealis* (rare on the New England coast).
Pacific eider, *Somateria v-nigra.*
Emperor goose, *Philacte canagica.* (Accidental in California.)

Deducting these, there are 54 species which regularly visit the United States during some portion of the year. Many of these, however, spend the breeding season north of the United States, and come south only in the winter season. Among these last are included both species of swans and most of the geese. Several species of ducks select Canada as their principal breeding ground, but a few individuals remain to breed in the northern part of the United States or in the mountains of the West. These are the scaup (*Aythya marila*), American golden-eye (*Clangula clangula americana*), Barrow golden-eye (*Clangula islandica*), buffle-head (*Charitonetta albeola*), harlequin duck (*Histrionicus histrionicus*), American eider (*Somateria dresseri*), and white-winged scoter (*Oidemia deglandi*). But the individuals which breed in the United States are so few—in the case of *Somateria dresseri* less than a dozen pairs—that they may be ignored in this discussion. Five other species of ducks breed entirely north of the United States, making, in all, 29 species that remain in summer north of our boundaries, as follows:

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[a] Occurs in the United States; *Netta rufina* but once.

SPECIES THAT BREED CHIEFLY NORTH OF THE UNITED STATES.

Red-breasted merganser, *Merganser serrator* (rare in the northern United States).
Red-legged duck, *Anas obscura rubripes*.
Scaup, *Aythya marila* (rare in the northern United States).
American golden-eye, *Clangula clangula americana* (rare in the northern United States).
Barrow golden-eye, *Clangula islandica* (rare in the Rocky Mountains of the United States).
Buffle-head, *Charitonetta albeola* (rare in the northern United States).
Old-squaw, *Harelda hyemalis*.
Harlequin duck, *Histrionicus histrionicus* (rare in the mountains of the northwestern United States).
American eider, *Somateria dresseri* (rare in Maine).
King eider, *Somateria spectabilis*.
American scoter, *Oidemia americana*.
White-winged scoter, *Oidemia deglandi* (rare in North Dakota).
Surf scoter, *Oidemia perspicillata*.
Lesser snow goose, *Chen hyperborea*.
Greater snow goose, *Chen hyperborea nivalis*.
Blue goose, *Chen cærulescens*.
Ross goose, *Chen rossii*.
White-fronted goose, *Anser albifrons gambeli*.
Hutchins goose, *Branta canadensis hutchinsii*.
Cackling goose, *Branta canadensis minima*.
White-bellied brant, *Branta bernicla glaucogastra*.
Black brant, *Branta nigricans*.
Whistling swan, *Olor columbianus*.
Trumpeter swan, *Olor buccinator* (formerly a few in the northern United States).

SPECIES THAT BREED CHIEFLY NORTH OF THE ARCTIC CIRCLE, WITH THE NORTHERNMOST LATITUDE AT WHICH THE SPECIES HAS BEEN OBSERVED IN THE WESTERN HEMISPHERE.

Old-squaw, *Harelda hyemalis*, 82°.
Steller eider, *Polysticta stelleri*, 71°.
Spectacled eider, *Arctonetta fischeri*, 71°.
Northern eider, *Somateria mollissima borealis*, 82°.
Pacific eider, *Somateria v-nigra*, 76°.
King eider, *Somateria spectabilis*, 82°.
Lesser snow goose, *Chen hyperborea*, 74°.
Greater snow goose, *Chen hyperborea nivalis*, 72° (accidental at 82°).
Ross snow goose, *Chen rossii*, 68°.
American white-fronted goose, *Anser albifrons gambeli*, 71°.
Hutchins goose, *Branta canadensis hutchinsii*, 70°.
Cackling goose, *Branta canadensis minima*, 71°.
White-bellied brant, *Branta bernicla glaucogastra*, 82°.
Black brant, *Branta nigricans*, 76°.
Whistling swan, *Olor columbianus*, 74°.

SOUTHERN SPECIES, WITH NORTHERN LIMIT OF BREEDING RANGE.

Florida duck, *Anas fulvigula* (northern Florida).
Mottled duck, *Anas fulvigula maculosa* (northern Texas; accidental in Kansas).
Masked duck, *Nomonyx dominicus* (southern Texas).
Black-bellied tree-duck, *Dendrocygna autumnalis* (southern Texas).
Fulvous tree-duck, *Dendrocygna fulva* (central California).

WESTERN SPECIES, WITH EASTERN LIMIT OF REGULAR RANGE.

Cinnamon teal, *Querquedula cyanoptera* (Kansas).

Steller eider, *Polysticta stelleri* (Alaska).

Spectacled eider, *Arctonetta fischeri* (Alaska).

Pacific eider, *Somateria v-nigra* (Mackenzie).

Ross goose, *Chen rossii* (Hudson Bay).

White-cheeked goose, *Branta canadensis occidentalis* (Nevada).

Cackling goose, *Branta canadensis minima* (California).

Black brant, *Branta nigricans* (Nevada and Mackenzie).

Emperor goose, *Philacte canagica* (Alaska).

SOUTHERN LIMITS OF SPECIES WHOSE WINTER RANGE EXTENDS SOUTH OF THE UNITED STATES.

American merganser, *Merganser americanus* (Mexico, accidental).

Red-breasted merganser, *Merganser serrator* (Mexico).

Hooded merganser, *Lophodytes cucullatus* (Mexico).

Mallard, *Anas boschas* (Panama).

Black duck, *Anas obscura* (Jamaica, accidental).

Gadwall, *Chaulelasmus streperus* (Mexico).

Baldpate, *Mareca americana* (Costa Rica).

Green-winged teal, *Nettion carolinense* (Honduras).

Blue-winged teal, *Querquedula discors* (Chile).

Cinnamon teal, *Querquedula cyanoptera* (Patagonia).

Shoveler, *Spatula clypeata* (Colombia).

Pintail, *Dafila acuta* (Panama).

Wood duck, *Aix sponsa* (Mexico).

Redhead, *Aythya americana* (Mexico).

Canvasback, *Aythya vallisneria* (Guatemala, accidental).

Scaup duck, *Aythya marila* (Bahamas).

Lesser scaup duck, *Aythya affinis* (Panama).

Ring-necked duck, *Aythya collaris* (Guatemala).

American golden-eye, *Clangula clangula americana* (Mexico).

Buffle-head, *Charitonetta albeola* (Mexico).

White-winged scoter, *Oidemia deglandi* (Mexico).

Surf scoter, *Oidemia perspicillata* (Mexico).

Ruddy duck, *Erismatura jamaicensis* (Costa Rica, accidental).

Masked duck, *Nomonyx dominicus* (Argentina).

Lesser snow goose, *Chen hyperborea* (Mexico).

American white-fronted goose, *Anser albifrons gambeli* (Mexico).

Hutchins goose, *Branta canadensis hutchinsii* (Mexico).

White-cheeked goose, *Branta canadensis occidentalis* (Mexico).

Black brant, *Branta nigricans* (Mexico).

Black-bellied tree-duck, *Dendrocygna autumnalis* (Panama).

Fulvous tree-duck, *Dendrocygna fulva* (Argentina).

Whistling swan, *Olor columbianus* (Mexico).

SUMMARY.

Species breeding regularly in the northern United States	19
Southern species ranging north to the southern United States	5
Species breeding in the United States	24
Species wintering in the United States but breeding northward	24
Species breeding or wintering in the United States	48
Species breeding and wintering north of the United States	5
Species breeding chiefly north of the Arctic Circle	15
Species breeding in the United States and northward	53
European species straggling to North America	11
Species occurring in the United States and northward	64
Southern species not ranging north to the United States	7
Total species and subspecies in North America	71

The material for determining the geographic range of the waterfowl included in this bulletin has been derived from various publications, from museum specimens, and from the notes of field agents of the Biological Survey. The data on migration are derived almost entirely from the migration schedules contributed since 1884 to this Bureau by hundreds of observers distributed throughout the United States and Canada. Opportunity is here taken to extend acknowledgments to the many whose painstaking observations for a long series of years have made possible the present publication.

DISTRIBUTION AND MIGRATION OF DUCKS.

Merganser americanus (Cass.). American Merganser.

Breeding range.—The principal breeding ground of this merganser is in southern Canada from the maritime provinces to Saskatchewan. Southward the species nests quite commonly in Maine, the colder portions of New Hampshire, and in Vermont; it probably has bred casually or accidentally in Massachusetts. It is rather common in the Adirondacks and is not rare in the lake region of northwestern New York. It formerly bred in several of the mountainous counties of central Pennsylvania (Perry, Lancaster, Clinton, and Lycoming), and may yet breed occasionally in that State and in Ohio. It breeds commonly at Ottawa and the Muskoka region in Ontario and it is not rare in the southern part of the Province and on the shores and islands of Lake Ontario. It is common in northern Michigan—rarely as far south as central Michigan—also in southwestern Minnesota (Heron Lake), South Dakota (Fort Sisseton, Black Hills), and south in the Rocky Mountains to northern New Mexico (near Santa Fe), north central Arizona (Fort Verde), and the Sierras of California.

The breeding range extends north to central Ungava (Hamilton River), Hudson Bay (York Factory), Great Slave Lake, and on the Pacific coast regularly to the Queen Charlotte Islands, and rarely to the base of the Alaskan Peninsula at about latitude 60° (Iak Lake, July 24, 1896).

Winter range.—On the Atlantic coast this duck ranges from Maine to South Carolina, rarely to Georgia and Florida; in mild winters it occurs as far north as Prince Edward Island; in the interior it winters from the Gulf of Mexico to southern Ontario, Lake Michigan, Kansas, northern Colorado, Idaho, British Columbia, and rarely to Unalaska Island and the Pribilof Islands. In winter it reaches northern Mexico and northern Lower California. It occurs occasionally in the Bermudas.

Spring migration.—Though the northward movement of this merganser begins early—late February—and there is much activity in the Mississippi Valley in March, on the Atlantic coast the advance beyond the usual winter home is comparatively late. The average date of arrival at Montreal is April 5; Ottawa, Ontario, April 16; Prince Edward Island, April 21. The first merganser was seen on Hamilton River, Ungava, May 28. At Heron Lake, Minnesota, the average date of arrival is March 26 (earliest March 17, 1886); average at Aweme, Manitoba, April 11. The larger number have left the winter range by early April; but along the middle Atlantic coast a few are seen in May, while on the Massachusetts coast nonbreeders occur all summer.

Eggs have been taken at Kingston, Ontario, April 10, 1902; at Godbout, Quebec, May 12, 1884; on Hamilton River, Ungava, June 25; eggs incubated one week, on Lake Tagish, Yukon, June 30, 1899; young in northern California May 21.

Fall migration.—A few of this species start south in August (Woods Hole, Mass., August 26, 1890), but in general the American merganser is a late migrant, passing south only when forced by winter storms. The average date of arrival on the Massachusetts coast is October 5, and on Chesapeake Bay October 15. The average date when the last are seen on Prince Edward Island is November 1; Montreal, November 6; Ottawa, Ontario, November 21.

Merganser serrator (Linn.). **Red-breasted Merganser.**

Breeding range.—Most of the summer home of this species in the Western Hemisphere lies north of the United States, though a few nest in Maine (Houlton, Magalloway River, Isle au Haute), and farther south on Sable Island, Nova Scotia; also in northern New York (Adirondacks), Michigan, Wisconsin (Green Bay), Minnesota (St. Paul), and probably in Oregon (Crooked River and Camp Harney). The breeding range extends far north to Greenland (Scoresby Sound, Upernavik), Cumberland Gulf, Mackenzie (Fort Anderson), Alaska (Icy Cape), and the northern coast of Siberia. The species breeds commonly on the whole western coast of Alaska, the Near Islands, the Yukon Basin, and south to southern British Columbia. It breeds commonly also in northern Europe and northern Asia, whence it retires in winter to southern Europe and central Asia.

Winter range.—A single specimen was taken near Habana, Cuba, in December, 1891, and this seems to be the only record south of the eastern United States. The species is not rare in winter in Florida and along the Gulf coast to Texas; thence it is quite rare in New Mexico and Arizona, but is common throughout the whole of California and south to Lower California (La Paz). It is common in winter on the Atlantic coast as far as Maine, and remains around the Gulf of Saint Lawrence until the bays freeze. It is not uncommon even in Greenland during the winter. In the interior it braves the winter on the Great Lakes and north to Wisconsin, Nebraska, Colorado, and Utah; north on the Pacific coast to southern British Columbia; it is casual on the Hawaiian Islands and the Bermudas.

Spring migration.--The red-breasted merganser winters so far north that few migration data are available. The species is most common on the Massachusetts coast during the first half of April, though migrants begin to pass a month earlier. The average date of arrival at Montreal is April 16 (earliest, April 6, 1894); at North River, Prince Edward Island, April 21 (earliest, April 15, 1891); Lake Mistassini, Ungava, May 11, 1895; Heron Lake, Minn., April 2, 1884, April 4, 1885; Aweme, Manitoba, April 22, 1899; Fort Keogh, Mont., April 27, 1889; Chilcat, Alaska, May 8, 1882; mouth of the Yukon about the middle of May; Kowak River, Alaska, middle of June (1899). The region in the United States to the south of the breeding ground is deserted in May, except by a few cripples and nonbreeders, some of which are present all summer on the coasts of New Jersey and New England.

Fall migration.—The first arrival in 1896 at Monterey, Cal., was noted October 9; about the same time the species appears in the corresponding latitude on the Atlantic coast. Indeed, October can be said to be the month of arrival in the winter home, and of departure from the most northern breeding grounds; the last was seen on the Mackenzie River, about latitude 63°, October 15 and 16, 1903.

Lophodytes cucullatus (Linn.). Hooded Merganser.

Breeding range.—This merganser breeds locally throughout much of North America, from Florida (Fort Myers and Titusville), Georgia, South Carolina, Tennessee, Kansas, Colorado, northern New Mexico, Nevada, and Oregon, north to Newfoundland, southern Labrador, Hudson Bay (Fort Churchill, latitude 62°), Great Slave Lake, and central British Columbia (Cariboo district). One specimen was seen at Fort Wrigley, Mackenzie River, latitude 63°, where possibly it may breed; it is accidental in Alaska (St. Michael, October, 1865), Bermudas, Europe. In the Southern States mentioned the species is quite rare and local, and the same seems to be true of all the district north of Maine and east of Ontario. The species is most common from latitude 44° to latitude 60°, between the Rocky Mountains and Lake Huron.

Winter range.—It remains during the winter rarely as far north as Massachusetts, Pennsylvania, Lake Michigan, Nebraska, Colorado, Utah, and southern British Columbia. It is more common in the central districts and Gulf States. A few migrate to Cuba, Central Mexico (Orizaba, City of Mexico), and southern Lower California.

Spring migration.—Since the hooded merganser breeds over much of its winter range, it is difficult to determine when its spring migration begins. Migratory movements occur in late February, and average dates of arrival are: Western New York, March; Montreal, early April; Ottawa, Ontario, April 18 (earliest, March 21, 1903); southern Michigan, March 19; central Iowa, March 22 (earliest, March 5, 1895);

Heron Lake, Minn., April 5 (earliest, March 20, 1889). On March 28, 1877, young, a week old, were found in central Florida. Eggs have been taken on April 20 in Illinois and on April 29 in southern Ontario.

Fall migration.—The species arrives in the valley of Mexico in October and in southern California in November. Many years' observations at Alexandria, Va., fix the average date of arrival there as October 26, and November 22 as the average date when the hooded merganser becomes common. The average date when the last left Montreal was October 29; southern Minnesota, November 10, and central Iowa, November 22.

Mergus albellus Linn. Smew.

This is an Old World duck which has been taken once as an accidental visitant to North America. The basis for its inclusion in the list is a single specimen, an adult female, now in the British Museum, which was purchased from the Hudson Bay Company (Cat. Birds Brit. Mus., XXVII, p. 468, 1895). There is no evidence as to the locality of its capture.

Anas boschas Linn. Mallard.

Breeding range.—The northern half of the United States west of Pennsylvania, and the whole of Canada west of Hudson Bay, constitute the principal breeding range in the Western Hemisphere of the mallard—the commonest duck on the North American continent and probably in the world. In eastern North America the place of the mallard is taken by the black duck, and the former is rather rare, though a few breed in eastern Ontario about Lake Erie, locally in western New York, and south to Maryland. Though unknown as a breeder on the mainland east of Hudson Bay, the mallard is rather common in Greenland, breeding north to Godthaab and Angmagsalik and wandering to Upernavik. Throughout New England and the Maritime Provinces it is a rare migrant, and while some of the records of its breeding in these districts may be correct, it is no more than a casual summer resident.

In the interior the breeding range extends regularly south to latitude 41° and a few breed south to southern Indiana, southern Illinois, central Missouri, and southern Kansas. The breeding range bends south in the Rocky Mountains to southern New Mexico and on the Pacific coast to Lower California (San Pedro Martir Mountains).

The breeding range extends north to Fort Churchill, to the Arctic coast in the Mackenzie Valley, and to Kotzebue Sound and the Fur Seal Islands in Alaska.

The mallard is one of the earliest birds to breed. The nesting season extends from early April in southern California and the first week of May in northern Indiana, to early June in the Mackenzie Valley and the Yukon Delta, and the last week of June in Greenland.

It is one of the common ducks of the Old World, breeding in the Northern Hemisphere and ranging south in winter to central Africa and southern Asia.

Winter range.—The mallard is a fresh-water duck, and in general it winters as far north as open fresh water is found. The greater number spend the winter in the southern half of the Mississippi Valley, and for many years this was the source of a large part of the market supply. The numbers killed were almost incredible. Big Lake, Arkansas, was and still is one of the favorite resorts, and during the winter of 1893–94 a single gunner sold 8,000 mallards, while the total number sent to market from this one place amounted to 120,000. Fortunately both Arkansas and Missouri now forbid market shooting, and this deplorable slaughter has been decidedly lessened.

This species winters casually in eastern Massachusetts and central New York, accidentally in Nova Scotia, and regularly from Virginia to northern Florida. It is less common in central Florida, and has been recorded in the Bermudas, Bahamas, Cuba, Jamaica, Grenada, Carriacou, Panama, and Costa Rica. Most of these localities have only one record each, showing that the mallard is only a straggler to the southeast of the United States. There seems to be no record for Central America from Costa Rica to Mexico. The species is a common winter resident of northern Mexico and ranges south to Jalapa, the Valley of Mexico, Colima, and southern Lower California.

The northern winter limit in the interior is in Ohio, northern Indiana, southern Wisconsin, Nebraska, Wyoming, and central Montana. The species is common in winter along the whole Pacific coast as far north as the Aleutian Islands.

Spring migration.—It is among the earliest of ducks to move northward and forms a large proportion of the early flocks. The portion of the central Mississippi Valley that forms the extreme winter range is invaded by the spring migrants the latter part of February; Frankfort, Ind. (average for ten years), February 21; central Illinois (twelve years), February 22; central Missouri (sixteen years), February 26; Keokuk, Iowa (nine years), February 24; southern Kansas (eleven years), February 18; southeastern Nebraska (five years), February 19. Just north of the winter range average dates of spring arrival are: Erie, Pa., March 5; central New York, March 23; Oberlin, Ohio, March 21; southern Michigan, March 9; southern Ontario, March 24; Ottawa, Ontario, March 27; Chicago, Ill. (eleven years), March 19; southern Wisconsin (twelve years), March 21; Spirit Lake, Iowa, March 10; Heron Lake, Minn., March 11; central South Dakota (fourteen years), March 16; Larimore, N. Dak. (twelve years), March 28; Terry, Mont., March 26. The mallard crosses into central Canada early in April, and the average date of arrival at Aweme, Manitoba (ten years), is April 3 (earliest March 24, 1905); Qu' Appelle, Saskatchewan (six years), April 10 (earliest, March 26, 1905). The earliest migrants were seen at Fort Resolution May 7, 1860; near Fort Providence, April 27, 1904; Fort Simpson, May 3, 1904; Kowak River, Alaska, May 17, 1899.

The last one seen in 1892 at Shellmound, Miss., was on April 5; in northern Texas one was seen as late as May 6, 1889. In central Missouri, where a few remain to breed, the average date when the last migrants are seen is March 28.

Fall migration.—In the fall this species returns with the general mass of ducks, and the average date of its arrival at Alexandria, Va., is September 21 (earliest, August 28, 1896); it becomes common October 27; at Chicago, Ill., September 27; Grinnell, Iowa, September 17; and in northern Texas October 11. The first one was noted at San Angelo, Tex., August 10, 1883, and at Austin, Tex., September 1, 1893.

The mallard is one of the moderately hardy ducks, and remains in the north until the lakes begin to freeze. Average dates when the last were seen are: Montreal, Canada, October 26 (latest, November 13, 1897); Scotch Lake, New Brunswick, November 7; Ottawa, Ontario (nine years), November 5 (latest, November 14, 1904); Aweme, Manitoba (eight years), November 12 (latest, November 23, 1902); Chicago, Ill., November 13; English Lake, Ind., December 9; southern Minnesota (ten years), November 22 (latest, December 11, 1890); central Iowa (12 years), November 15 (latest, November 27, 1903); central Nebraska, November 18 (latest, November 26, 1899).

Anas obscura Gmel. Black Duck.

Breeding range.—The group of 'black' or 'dusky' ducks comprises several species which closely resemble each other and which have been distinguished only in recent years. The black duck is the common breeding duck of New England and northern New York, south of which it breeds not rarely on Long Island and locally in Pennsylvania (Bradford County), New Jersey (Long Beach), Delaware, and Maryland (Ocean City, Barrow Springs). To the westward the breeding range extends south to Ohio (formerly), Indiana (Lake County), Illinois, Iowa (Spirit Lake), and Minnesota (Kandiyohi County). It breeds rarely and locally over much of Wisconsin, but breeds more commonly in Michigan and southern Ontario. It is a very common summer resident of Quebec, New Brunswick, Nova Scotia, and the islands of the Gulf of St. Lawrence. The most northern points at which it breeds are in southern Labrador and Newfoundland. Somewhere in Labrador and in northern Ontario this form meets the more northern form, the red-legged duck (*Anas obscura rubripes*), but the dividing line between the two is unknown. A specimen from the Straits of Belle Isle is *obscura;* one from Okak, Labrador, is intermediate, and one from Ungava Bay, only a few miles farther north, is *rubripes.*

The black duck breeds so early that young have been found at Old Saybrook, Conn., May 5, and eggs at Rehoboth, Mass., April 30.

Winter range.—This species is accidental in winter in the West Indies (Jamaica), rare in the Bermudas, and rare in central Florida (Gainesville) and also in Alabama. From Georgia northward it is more common, and from North Carolina to New Jersey it is one of the abundant winter ducks. Black ducks, including both *A. obscura* and *A. rubripes,* are abundant at this season around Long Island and on the shores of Rhode Island and Massachusetts, but although a few *A. obscura* winter in Massachusetts, the greater number are *A. rubripes.* West of the Alleghenies there is uncertainty as to which form preponderates in winter. *A. obscura* is a tolerably common winter resident of Louisiana, but *A. rubripes* reaches Arkansas, and one form or the other winters as far north as southern Ohio, southern Indiana, and southern Illinois. In migration *A. obscura* is rare west to eastern Nebraska (Fairmont, Gresham, Calhoun) and eastern Kansas (Reno County, Wichita, and Lawrence). Notes on the migration of this species are for the most part included under those of *A. rubripes.*

Anas obscura rubripes Brewst. Red-legged Black Duck.

Breeding range.—As stated under the last species, a breeding duck from Okak, northeastern Labrador, is considered intermediate between this form and *A. obscura,* while the bird breeding at Ungava Bay is *A. rubripes.* This Ungava Bay record seems to mark the northeastern limit of the species so far as reported. Thence the species extends west to Hudson Bay, as far north at least as Fort Churchill, and is rare or accidental west to Manitoba (Long Lake; Lake Manitoba, October 28, 1900; Delta, September 4, 1902, September, 1903; St. Marks, two, October, 1902), and to Fort Anderson. The southern limit of the breeding range in Ontario has not yet been determined.

Winter range.—Most of the black ducks that winter in Massachusetts are *A. rubripes,* and this is about as far north as the species commonly winters. Along the coast some have been known in winter as far north as Nova Scotia. How far south the species goes has not yet been determined, but it is common on the coast of South Carolina from November to March, and a specimen was taken in Mississippi County, Ark., November 5, 1887. It occurs west to Nebraska (Greenwood, Lincoln, Calhoun) and undoubtedly wanders to eastern Kansas. The northern winter limit in the interior is probably from northwestern Pennsylvania to southern Wisconsin.

Spring migration.—It is impossible to separate the migration records of *A. obscura* and *A. rubripes.* The following migration notes probably refer for the most part to *A. rubripes*, because that form winters farther north. In March extensive northward movements of black ducks occur, but it is not until early April that the birds pass beyond the usual winter range. The average date of arrival for seventeen years in southern Maine is April 7; the earliest, March 19, 1894; the average date for Montreal is April 14, and March 27, 1889, is the earliest; Quebec, average, April 18 (earliest, April 6, 1896); Godbout, Quebec, average, April 21; Prince Edward Island, April 23 (earliest, April 5, 1898). Farther west the average date of arrival in southern Ontario is April 7 (earliest, March 16, 1901); average at Ottawa, April 14 (earliest, March 21, 1903).

Fall migration.—A black duck was seen at Washington, D. C., August 1, 1887; one at Alexandria, Va., August 14, 1886, and one at Hog Island, Va., August 20, 1886; but these are unusually early records. The average of a long series of excellent records at Alexandria, Va., is September 30 for the arrival of the first and October 31 as the average date when they become common. About the middle of October, on the New England coast, they become common enough to usher in the shooting season. These dates, of course, apply to *A. obscura.* There are no exact records of the time when *A. rubripes* arrives from its northern breeding grounds, but it is supposed that it reaches New England about the first week in October. In winter it remains as far north as it can find open water. The average date when the last leave Ottawa, Ontario, is November 7 (latest, November 21, 1892); average at Montreal, November 6 (latest, November 14, 1896). The last one was seen at Prince Edward Island November 13, 1889, and December 8, 1890.

Anas fulvigula Ridgw. Florida Duck.

A nonmigratory species, breeding commonly in the southern half of Florida, and less commonly in the northern portion. It seems to be absent from northeastern Florida, but occurs along the northwestern coast of the State. Nests in late April and in May, but sometimes much earlier, for downy young have been taken as early as April 6.

Anas fulvigula maculosa (Senn.). Mottled Duck.

Resident in Texas and southern Louisiana (Lake Arthur). In Texas it occurs from the mouth of the Rio Grande northward and west to about the middle of the State. It is accidental in Kansas (Neosho Falls, March 11, 1876). It breeds throughout most if not all of its Texas range; the eggs are deposited in April.

[**Anas diazi** Ridgw. Diaz Black Duck.

A form of 'black duck' closely resembling *Anas fulvigula.* It is nonmigratory and occurs in central Mexico from Chihuahua City to Tepic, Jalisco, Michoacan, the Valley of Mexico, Puebla, and Tlaxcala.]

[**Anas aberti** Ridgw. Abert Duck.

A species known only from the type specimen taken at Mazatlan, Mexico.]

Chaulelasmus streperus (Linn.). Gadwall.

Breeding range.—A large majority of the North American individuals of this species breed in the prairie district extending from Manitoba to the Rocky Mountains, south to western Minnesota, and from northern South Dakota north to the Saskatchewan.

The species breeds commonly from the Rocky Mountains to the Pacific, south to southern Colorado, Utah, Nevada, and in nearly the whole of California; also probably in the Mogollon Mountains of Arizona. The northern range extends to southern British Columbia, Alberta (rarely or casually to Lesser Slave Lake), and to Fort Churchill on Hudson Bay. There is no authentic record for the Mackenzie Valley, and if the specimen in the British Museum labeled "Bering Straits" really was captured there it was a wanderer, as was also one taken at Unalaska, March 18, 1879.

In the Mississippi Valley the gadwall occasionally breeds in northern Nebraska and rarely in Kansas. Formerly it bred in Wisconsin (Horicon Marsh and Lake Koshkonong), there is one record for Ontario (St. Clair Flats), and one for Anticosti Island. It is only a straggler to New England and the Maritime Provinces north to Quebec and Newfoundland, and east of the Mississippi is rare north of North Carolina.

The gadwall is a common breeder in Europe and Asia, ranging south in winter far into Africa and to southern Asia.

Winter range.—The principal winter home of the gadwall is in the lower Mississippi Valley, especially Texas, Louisiana, and Arkansas. It rarely winters as far north as Illinois, but is more common to the eastward in North Carolina and Florida; accidental in Cuba (twice), Jamaica, and the Bermudas. The winter range extends to the southern end of Lower California, to Mazatlan, and the City of Mexico. In northern Mexico the species is common through the winter, and birds have been found paired in May, the late date indicating that they intended to remain and breed. Thence it extends commonly to Utah and Oregon, rarely to Washington and British Columbia.

Spring migration.—Only a few notes on the migration of this species have been recorded. The average date when the first spring migrants reach southern Iowa is March 18 (earliest March 10, 1896), it thus being one of the earlier ducks in this part of its range. It reached Heron Lake, Minn., April 1 (earliest March 17, 1886); Loveland, Colo., March 6, and Terry, Mont., about April 1. The first migrant was seen at Aweme, Manitoba, April 23, 1898, and at Indian Head, Saskatchewan, April 18, 1892, and April 24, 1904. Eggs have been secured at St. Clair Flats, Ontario, about May 30; in western Minnesota, June 14, 1879; northern North Dakota, June 15, 1901; Manitoba, June 5, 1894; Crane Lake, Saskatchewan, June 9, 1894; Nevada, May 29, 1868, and incubated eggs in Los Angeles County, Cal., April 16.

Fall migration.—The first arrived at the southern end of Lower California September 27, 1887; in northern New Mexico the species was abundant the last days of September, 1904. The average date when the last left central Minnesota was November 14.

Mareca penelope (Linn.). European Widgeon.

This is an Old World species which has occurred as a straggler on the Atlantic coast in Florida, North Carolina, Virginia, Maryland, Pennsylvania, New Jersey, New York, Massachusetts, Nova Scotia, Newfoundland, and Greenland; in the interior it has been found in Illinois, Indiana, Ohio, Michigan, Wisconsin, and Nebraska; on the Pacific coast in California, British Columbia, and Alaska. It is not known to breed anywhere in the Western Hemisphere.

On the Atlantic coast the dates are almost entirely in the fall and winter, from October 20 (near Halifax, Mass.) to March 25 (Keuka Lake, New York)—there are only three records after February 5—while in the interior its occurrence is as strictly confined to the spring, from March 23 (English Lake, Ind.) to April 18 (Sandusky, Ohio). The records for Greenland fall between September 29 and December 17; the California records are mostly in February, while those of British Columbia are from December 25 to February 9, and the two Alaska dates are October 12 and May 27.

Mareca americana (Gmel.). Baldpate. American Widgeon.

Breeding range.—A line drawn from the western shore of Hudson Bay to the western shore of Lake Michigan marks, approximately, the eastern boundary of the breeding range of this species, and in the eastern 200 miles of this district it is decidedly uncommon during the nesting season. There are a few records of the bird's breeding in Indiana (Hogback Lake, English Lake) and in Wisconsin (formerly at Koshkonong and Horicon), but not until Minnesota is reached does this duck breed commonly. West of the Mississippi it breeds abundantly in North Dakota, a few in southern South Dakota, and rarely or casually in Nebraska and Kansas. It is a common breeder in Colorado, Utah, and Nevada (Truckee Valley), and probably breeds rarely in Arizona (Mormon Lake), but as yet the species has not been recorded as nesting in California. The main breeding range is northwestern North America from Oregon and Minnesota north to the Mackenzie Valley and central Alaska. A line from Fort Churchill, Hudson Bay, to Franklin Bay is the approximate northeastern boundary of the range, thence west to Kotzebue Sound. If this line from Franklin Bay to Fort Churchill is continued to Chesapeake Bay, it marks the approximate eastern limits at which the species is common in migration. Northeastward the species is known as a rare migrant, in New England hardly more than a straggler, but it has been recorded as far as Newfoundland, southern Labrador (Natashquan), and northern Ontario (Moose River). The baldpate is rather rare on the coast of Alaska, but is more common in the interior, and is a rare or casual visitor to the Near, Commander, and Bermuda islands.

Winter range.—The baldpate is common on the Chesapeake in winter, but as it is rare directly to the northward at all times of the year, it is evident that the migration is from the northwest. Occasionally birds are found in winter as far north as Rhode Island. The species is common during the winter in the Carolinas, less common in Florida and Cuba, and rare in the Bermudas, the Bahamas, Jamaica, Porto Rico, St. Thomas, and Trinidad. It is recorded from Costa Rica, and is a rather common winter resident of northern Guatemala and much of Mexico north of the Valley of Mexico. The winter home in the Mississippi Valley extends north to Illinois, and in the west to New Mexico, Arizona, Utah (probably), and to southern British Columbia. It is probably most common during the winter along the Pacific coast.

Spring migration.—This begins late in February and by early March the species is north of its winter home. Average dates of arrival are: Western New York, March 23; Erie, Pa., March 24; Oberlin, Ohio, March 17; southern Michigan, March 25; Keokuk, Iowa, March 15; central Nebraska, March 17; Loveland, Colo., March 10. The further advance of the species is somewhat slow. The average time of reaching Heron Lake, Minn., is March 29; southern Manitoba, April 20; Terry, Mont., April 8. The first individual was seen at Indian Head, Saskatchewan, April 24, 1904, and at Osler, Saskatchewan, May 2, 1893. These dates indicate an average speed of 17 miles per day from central Nebraska to Heron Lake, and 18 miles per day thence to southern Manitoba. The average rate from Colorado to Montana is 16 miles per day, and the same rate continued northward would bring the first baldpate to Indian Head and Osler at almost exactly the stated dates. If the birds of the Mississippi Valley pass northwest to the Mackenzie Valley, this rate of migration would bring them to Great Slave Lake about the first week in June, whereas the first arrival at Fort Simpson, Mackenzie, was April 28, 1904; and a female was shot at Fort Resolution May 24, 1860, which contained a fully formed egg. It is evident, then, that the earliest arrivals in the Mackenzie Valley come from the southwest, where, in southern British Columbia, the species winters a thousand miles farther north than on the plains. The baldpate arrives at the mouth of the Yukon in early May, and on the Knik River, Alaska, the first bird was noted May 10, 1901. Most of the few spring records in New England are in April, two in February, but the species is apparently less common in the spring than in the fall. The last migrants usually leave Cuba late in April, though in Guatemala they have been seen as late as May.

Fall migration.—The month of September, especially the latter half, sees the arrival of the first baldpates over most of the district between the breeding grounds and Cuba and Louisiana; but these are only the advance scouts; the main body appears in the northern United States early in October, and reaches the middle Atlantic States about the middle of that month. Dates of arrival are: Middletown, R. I., September 20, 1889; East Hartford, Conn., September 29, 1888; Beaver, Pa., August 30, 1890. Stragglers have been seen in Massachusetts and in northern Pennsylvania as late as the first week in December, but most leave at least a month earlier. The average date at which the last were seen at Ottawa, Ontario, is October 27, latest November 6, 1890; at Keokuk, Iowa, November 13, latest November 18, 1892. The last was seen at Montreal September 20, 1897; Edmonton, Alberta, November 6, 1896; Kowak River, Alaska, September 20, 1898; St. Michael, Alaska, October 1.

Nettion crecca (Linn.). European Teal.

This is a widely distributed Old World species, accidental in the Western Hemisphere. It has been taken in Greenland, Labrador, Nova Scotia, Maine, Massachusetts, Connecticut, Long Island, near Washington, D. C., California, and Alaska. The dates of capture range through every month of the year, except January, August, and October; those for the United States from November to April.

Nettion carolinense (Gmel.). Green-winged Teal.

Breeding range.—A few probably have bred in the mountains of north central Pennsylvania (Lycoming County), and it has been reported as nesting near Buffalo, N. Y. The regular breeding range extends from New Brunswick, through northeastern Quebec and Newfoundland, to Ungava Bay, Labrador, latitude 58°. It is a common migrant in Ontario, and hence undoubtedly breeds in the northern part. It has been recorded as a rare breeder in southern Ontario (Toronto, Point aux Pins, Oshawa, Gravenhurst). The southern boundary of the breeding range to the westward is found in Illinois (Rockford, Lacon, Fernwood), in Michigan (Neebish Island), Wisconsin (Lake Koshkonong, formerly), Minnesota (Faribault, Heron Lake), Nebraska (Dewey Lake, Badger, Valentine), Colorado (Beloit, San Luis Valley), New Mexico (San Miguel County), Utah (Salt Lake), Nevada (Washoe Lake), Oregon (Fort Klamath). The range extends north to the edge of the Barren Grounds from near Fort Churchill, Hudson Bay, to Fort Anderson, to Kotzebue Sound, and nearly to Point Barrow. It breeds throughout the Aleutian Chain to the Near Islands. It is rare as a breeder everywhere in the United States east of the Rocky Mountains, and the main breeding grounds are in west central Canada from Manitoba to Lake Athabasca. It has wandered a few times to the west coast of Greenland, from Nanortalik to Disco Bay, and was once taken in May on the east coast at Nanusek. The species is accidental in Great Britain, the Bermudas, and Hawaii.

Winter range.—South of the United States it is common in Mexico, at least as far as Jalapa, the City of Mexico, Michoacan, and Jalisco; common also in the Bahamas, and rare in Cuba, Jamaica, and Honduras. It has been recorded on the islands of Carriacou, Grenada, and Tobago, of the Lesser Antilles.

It is one of the most abundant ducks throughout the southwestern United States during winter. It is a hardy duck, and in general remains as far north as it can find open fresh water. Thus it winters in western Montana (Great Falls), central Utah, southern Nebraska, southern Iowa, central Illinois, central Indiana (rarely Lake Michigan), western New York, and Rhode Island. It is accidental in Massachusetts in winter, and one was found at Halifax, Nova Scotia, January 14, 1890. The principal winter home in the Mississippi Valley lies south of 37° latitude.

Spring migration.—The green-winged teal is one of the early migrating 'river ducks,' but not quite so early, by about five days, as the mallard. Along the Atlantic slope it passes north of its winter home in early March, and the average date of its arrival in southern Pennsylvania is March 16; southern Connecticut, April 6; Montreal, Canada, April 27, Prince Edward Island, April 26.

The average date of the first arrivals in central Missouri is February 26; central Illinois, March 7; English Lake, Ind., March 15; Keokuk, Iowa (average for twelve years), March 3; central Iowa (fourteen years), March 11; Heron Lake, Minn. (six years), March 24 (earliest March 6, 1887). In its migration along the eastern border of the Plains the green-winged teal is noted at Onaga, Kans., March 8; northern Nebraska, March 12; central South Dakota, March 20; northern North Dakota, April 6; Aweme, Manitoba, April 16, and southern Saskatchewan, April 19. These dates indicate the rather slow rate of only 18 miles a day. The average of five years' records of arrival at Terry, Mont., is March 23, a date about ten days earlier than that at which the species appears in the same latitude in Minnesota. Its winter home on the Pacific coast extends 1,500 miles farther north than on the Atlantic, and hence it is not surprising that the bird has been seen on the middle Yukon by May 3 and at the mouth of the Yukon by May 10.

South of the breeding range the last green-winged teal was seen at Raleigh, N. C., April 13, 1900; Hester, La., April 6, 1902; northern Texas, April 16, 1886. The average date of disappearance for eight years at Keokuk, Iowa, is April 7, latest, April 30, 1892.

Eggs were taken at Nulato, Alaska, latitude 65°, May 20, and no earlier date seems to be recorded for the regions to the south. Eggs have been found at Edmonton, Alberta, latitude 54°, May 27, and in southern Ontario, latitude 45°, May 22. Downy young were seen in the Devils Lake region of North Dakota June 20.

Fall migration.—An average date for the reappearance of the green-winged teal at Erie, Pa., is September 15 (earliest, September 1, 1894); at Alexandria, Va., September 29 (earliest, September 22); but it is not considered common until early November. Corresponding dates of arrival are: Keokuk, Iowa, September 21; central Kansas, September 12; central Texas, September 22; central California, September 17. The last was noted on Prince Edward Island, November 4, 1890; Montreal, Canada, November 1, 1893; Aweme, Manitoba, October 30, 1896; Kowak River, Alaska, September 3, 1898; St. Michael, Alaska, the first week in October. The average date of the last seen in southern Ontario (thirteen years) is October 28 (latest, November 7, 1890); at Keokuk, Iowa (seven years), November 22 (latest, November 27, 1902).

Querquedula discors (Linn.). Blue-winged Teal.

Breeding range.—The principal summer home of this teal is the interior of North America between the Rocky Mountains and the Great Lakes, from Northern Illinois and central Iowa north to Saskatchewan. The species is not common east of the Allegheny Mountains nor on the Pacific slope. It has been recorded as breeding rarely in Rhode Island (Sakonnet, 1890), Maine (Calais), New Brunswick (Kings County, St. John County), Nova Scotia, Anticosti Island and Newfoundland, Quebec (Montreal, Point de Monts), Ungava (Clearwater Lake, latitude 57°), rare in southern Ontario (Toronto), New York (Utica, Auburn, Buffalo, formerly Long Island, Black Pond, Ulster County). It breeds as far south as northern Ohio (Port Clinton, Sandusky), southern Indiana (Gibson County and Wheatland), southern Illinois (Anna), central Missouri (Kings Lake, Warrensburg, Kansas City), central Kansas (Emporia, Wichita, Medicine Lodge, Fort Hays)—casual or accidental breeding at Fort Reno, Okla., and San Antonio and Spring Lake, Texas—southern Colorado (Fort Garland and La Plata County), New Mexico (Santa Rosa; Black Lake, Colfax County; Chloride), probably in Arizona (Mogollon Mountains), central Utah (Thistle Valley, Fairfield), northern Nevada (Truckee Valley, Washoe Lake), and central Oregon (Burns).

The breeding range extends north to central British Columbia (Lac la Hache, 158-Mile House); but the bird is rare or accidental in Alaska (Cape Romanzoff), Alberta (Edmonton), and on Great Slave Lake. Much remains to be learned in regard to the nesting of the blue-winged teal in the West Indies and Central America. It breeds in Jamaica and in the Lesser Antilles, quite probably also in Honduras and in western Mexico (Mazatlan), near the southern end of Lower California.

The resident teal of Jamaica probably should be separated subspecifically as *Querquedula discors inornata* (Gosse), but the eastern and western boundaries of this form remain to be determined.

Winter range.—Blue-winged teal migrate over a vast extent of territory, and are found in winter throughout northern South America south to Brazil, Ecuador, Peru, and Chile. They occur abundantly in Central America, Mexico, and the West Indies, and are equally common during the winter in the Gulf States and north to North Carolina. In the Mississippi Valley few remain much north of the Gulf, though these few are scattered widely as far as southern Indiana and southern Illinois; a few winter in Arizona, and the small number of Pacific coast birds spend the winter in California and north to southern British Columbia.

North of North Carolina this teal can hardly be called a common winter species, though it is not rare on Chesapeake Bay and winters even as far north as Delaware. This species is one of the least hardy of our ducks, and few individuals remain where there is cold and ice.

Spring migration.—The blue-winged teal is among the latest ducks to migrate. The first was noted at Erie, Pa., March 27, 1898; Templeton, Mass., April 1, 1898; Prince Edward Island, April 20, 1888. In central Iowa, where the hardy ducks appear in February, the blue-winged teal was noted on the average (ten years) March 26 (earliest, March 18, 1899); northern Iowa, April 4, and Heron Lake, Minn., April 9. The records of Heron Lake are quite uniform—April 11, 1885; April 11, 1886; April 10, 1887; April 8, 1888; April 9, 1889; April 7, 1890. These dates indicate less variation in the time of arrival of this species than of any other. The blue-winged teal appears in southeastern Nebraska, March 28; central South Dakota, April 2; central North Dakota, April 12; northwestern Minnesota, April 23; Aweme, Manitoba, April 27.

In southern Texas this teal becomes common in spring about the middle of March; about the first week in April is the height of the shooting season in southern Louisiana. The latest migrants have been noted at Gainesville, Fla., April 29, 1887; Baltimore, Md., May 7, 1890; New Orleans, La., May 21, 1898; San Antonio, Tex., May 14, 1902. Eggs have been taken at Canton, Ill., May 16, 1897. Eggs just hatching were found on the Magdalen Islands, Gulf of St. Lawrence, June 16, 1900, and fresh eggs at Waseca, Minn., June 1; in North Dakota, June 12; and at Reaburn, Manitoba, June 4, 1894.

Fall migration.—The blue-winged teal is one of the earliest ducks to move southward; during the month of August it reappears throughout the northern half of the United States and some especially early birds almost reach the Gulf of Mexico. During a period of fourteen years the average date of arrival at Alexandria, Va., was August 31 (earliest, August 18, 1889); they became common on the average September 23, though in the fall of 1887 they were already numerous September 10. The average date of arrival in central Kansas is September 12, and in southern Mississippi, September 16.

The average date at which the last was seen at Montreal was September 25; latest, September 29, 1888; the last one seen on Prince Edward Island in this same year was October 8; Lewiston, Me., November 7, 1901; Cape May, N. J., December 5, 1884.

The average date for eight years when the last one was seen at Ottawa, Ontario, is October 13 (latest, October 27, 1894); Chicago, Ill., October 18 (latest, October 22, 1904); southern Iowa, October 22 (latest, November 4, 1885); central South Dakota, October 7; eastern Nebraska, November 11; central Missouri, November 6 (latest, November 13, 1902). The last one seen in 1896 at Aweme, Manitoba, was on October 30. During the fall migration the blue-winged teal is fairly common on the Bermudas, but it rarely occurs there in spring.

Querquedula cyanoptera (Vieill.). Cinnamon Teal.

Breeding range.—The breeding range of the cinnamon teal differs essentially from that of almost every other duck in the Western Hemisphere. It consists of a large area north of the equator and a similar district south of the equator, and these two homes are separated by a strip about 2,000 miles wide, in which the species is practically unknown. In North America the breeding range extends north to southern British Columbia (Lac la Hache) and southwestern Alberta; east to eastern Wyoming (Lake Como, Cheyenne), western Kansas (Fort Wallace, Meade County); south to northern Lower California (La Grulla, San Rafael Valley, and possibly San Jose del Cabo), northern Mexico (Chihuahua City), southern New Mexico (Carlsbad), and southwestern Texas (Marathon, Rock Spring).

The cinnamon teal occurs sparingly in migration as far east as Houston, Tex., and Omaha, Nebr. It has been noted as accidental at Oak Lake, Manitoba; Big Stone Lake, Minnesota; Lake Koshkonong, Wisconsin; Licking County Reservoir, Ohio; Seneca River and Seneca Lake, New York; Lake Pontchartrain, Lake Cattawatchie, St. Malo, and Opelousas, Louisiana; Mount Pleasant, S. C.; Lake Iamonia and Key West, Florida.

Throughout this breeding area the eggs are deposited during May and June. About six months later the South American colony breeds. The breeding range includes the pampas of Argentina as far north as Buenos Aires, while in the Andes it extends north to central Peru (Santa Luzia). Southward the species breeds as far as the Falkland Islands and the Straits of Magellan. These South American breeders, of course, are not the same birds which nest in North America, for it is true, without exception, that no bird which breeds north of the equator breeds also in the Southern Hemisphere.

Winter range.—The cinnamon teal of North America retires in winter but little south of its breeding range in Mexico as far as Mazatlan, Guanajuato, and the Laguna de Chapulco, Puebla. It is found at this season as far north as Brownsville, Tex., central New Mexico, southern Arizona, and Tulare Lake, California. South of Mexico the only record is of an accidental occurrence in Costa Rica. There is no reliable record as yet for the West Indies.

During the winter season the cinnamon teal of the Southern Hemisphere has been noted as far south as the mouth of the Senger River, in Patagonia, latitude 44° S., and Chiloe Island, Chile, in nearly the same latitude. The northern range in winter is not determinable with exactness from present data. The species passes north to Rio Grande do Sul, Brazil, and to southern Paraguay. It has been noted at Chorillos and Tungasuca, Peru; near Quito, Ecuador; at Bogota and Santa Marta, Colombia. These Ecuador and Colombia teal may be accidental occurrences; it is significant, at least, that all the specimens from Colombia were taken a half a century ago, and the species has not been noted there by recent collectors.

Spring migration.—The northward movement of the cinnamon teal in the United States begins about the 1st of March, and arrivals have been noted at Ash Meadows, Nevada, March 18, 1891; Grangeville, Idaho, April 11, 1887; Chilliwack, British Columbia, April 24, 1888, and April 22, 1889; Beloit, Colo., March 23, 1892; Colorado Springs, April 9, 1882; Loveland, Colo., April 13, 1890; Lay, Colo., April 20, 1890; Omaha, Nebr., April 10, 1896, and April 12, 1897; Lake Como, Wyoming, about May 5.

Fall migration.—Southward migration occurs chiefly in September, and the northern portion of the breeding grounds from British Columbia to eastern Colorado is deserted about the middle of October.

Migration in South America.—The cinnamon teal of South America is migratory in at least part of its range, for in central Argentina it is abundant during the winter season, April to September, and rare or lacking during the breeding period. The species is migratory also in the southern portion of its range in Chile. In northern Chile and in Peru migration records are wanting. The time and direction of the migration of this species in South America correspond closely with those in the United States, but of course the breeding and wintering seasons are reversed, since they are on opposite sides of the equator.

Thus the cinnamon teal is distributed in two distinct colonies, part of the individuals breeding far north of the equator, and the rest about an equal distance to the south. The northern breeders migrate south after nesting, and the southern breeders migrate north. Whether or not the members of these two groups now represent subspecies, they are so much alike as to indicate a common origin and a former continuous breeding range. Whether isolation was gradual or was effected rapidly it is impossible to say, nor do we know the cause.

Casarca casarca (Linn.). Ruddy Sheldrake.

This is a European, African, and Asiatic species that has been taken several times in western and northern Greenland.

Spatula clypeata (Linn.). Shoveler.

Breeding range.—The principal North American summer home of the shoveler is in the prairie region of the interior, from a little south of the Canadian border, north to the Saskatchewan. Throughout this region it is common. To the eastward it is rare. It is scarcely common as far as Hudson Bay; nor is it common east of a line from southeastern Michigan to the mouth of Chesapeake Bay, in which latter region it is found only in migration and in winter. In the maritime provinces of Canada, and even north to Newfoundland, the shoveler has been recorded as a rare or casual visitor; but reliable breeding records from this region seem to be lacking. It is rare as a breeder in southern Michigan, and to the eastward is almost accidental in summer, though it has been known to breed at English Lake, northwestern Indiana, and at Long Point, on the north shore of Lake Erie. The regular breeding range extends south to northern Iowa and southern South Dakota; thence southward it breeds rarely and locally in Nebraska and Kansas, and during the summer of 1905 one of the parties of the Biological Survey found it breeding near East Bernard, about latitude 29° 30′, in southeastern Texas. In the western United States the species breeds commonly from Colorado to northern California, and rarely in New Mexico (Santa Rosa), Arizona (Mogollon Mountains), and southern California (Los Angeles County). On the southern coast of Texas the species is not uncommon all summer, though these summer residents are probably nonbreeders. Mated birds have been found in May in northern Chihuahua, Mexico, and at the southern end of Lower California, and it is not improbable that the species may breed locally in these districts, and even south to Lake Chapala, Jalisco.

The northern limit of the usual breeding range is from the valley of the Saskatchewan to central British Columbia. The species is a rare breeder thence northward to the edge of the Barren Grounds, casually to Fort Anderson and Fort McPherson. It is rather rare in the Yukon region, but has been known to breed at Fort Yukon, Nulato, and along the west coast of Alaska from the mouth of the Kuskokwim River to Kotzebue Sound. The shoveler has a wide range in the Eastern Hemisphere, breeding north about to the Arctic Circle, and retiring in winter to northern Africa and southern Asia.

Winter range.—A few pass south in winter to Colombia, South America (Medellin, Bogota), Panama, Costa Rica, and through the West Indies (Cuba, Jamaica, Porto Rico, St. Thomas, Barbados, and Trinidad). It is rare in Florida, and seems not to have been noted in the

Bahamas. The Carolinas are the only place on the Atlantic coast where the species is common. It is not rare in Maryland, and there are a few winter records for New Jersey. The greater portion of the species winters in the southern Mississippi Valley, north rarely to southern Illinois—accidental January 11, 1892, at Lanesboro, Minn.—and south through Mexico to central Guatemala; indeed many hundreds of thousands are said to winter near Lake Chapala, Jalisco. At this season it is found in New Mexico, Arizona, all of California, and less commonly north on the Pacific coast to southern British Columbia. Numbers winter in the Hawaiian Islands. During flight between the winter and summer home it passes through the northeastern United States, not rarely through Pennsylvania and New York, and formerly it was not rare in Massachusetts; but for the last fifteen years there has been hardly more than a single record a year for the whole of New England.

Spring migration.—Records of the movements of this species are not numerous enough to permit exact statements. Migration begins late in February, but is slight before the middle of March, at which time the species begins to appear north of its winter range. Average dates of arrival are: Central Illinois, March 23; central Iowa, March 23 (average of sixteen years); Heron Lake, Minn., March 26; central Nebraska, March 25; central Colorado, March 12; vicinity of Chicago, Ill., April 16; southeastern Minnesota, April 9; central North Dakota, April 13; southern Manitoba (twelve years); April 21; Terry, Mont., April 13. The first were seen near Edmonton, Alberta, May 1, 1901; Fort Chipewyan, Mackenzie, May 7, 1893; Fort Resolution, Mackenzie, May 18, 1860, and at the mouth of the Yukon River the second week in May. The general time of breeding can be learned from the following dates: Haywards, Cal., eggs April 25, 1901; East Bernard, Tex., downy young May 14, 1905; Fort Snelling, Minn., eggs May 23; North Dakota, incubated eggs June 7; Oak Lake, Manitoba, eggs May 24, 1892.

Fall migration.—An individual seen at Erie, Pa., September 6, 1893, marks about the beginning of fall migration, and soon after this, by the middle of the month, the earliest migrants have reached the mouth of the Mississippi River. The larger portion has departed from the northern United States by the middle of October, and the region just north of the winter range is deserted early in November. South of the United States, at the southern end of Lower California, the first arrivals have been recorded October 18; Guaymas, Mexico, November; Panama, October 16; Cuba, September; Jamaica, November; Trinidad, December.

Dafila acuta (Linn.). Pintail.

Breeding range.—This is a common breeding duck throughout a wide stretch of country from North Dakota to the Arctic Ocean and

Alaska. The western shores of Hudson Bay seem to be the eastern limit of the normal breeding ground in North America. A few birds have been seen in Labrador, north to Ungava Bay, on the west coast of Greenland, north to Upernavik, and also in Newfoundland and the Maritime Provinces. But there are only a few breeding records east of the line from the western side of Hudson Bay to the western shore of Lake Michigan; examples are: St. George Island, James Bay; St. Clair Flats, Ontario, and the north shore of Lake Erie. Breeding abundantly along the northern border of the United States from Lake Superior nearly to the Pacific Ocean, the species decreases in numbers southward until it is rare or casual as a breeder in southern Wisconsin, northern Illinois (Will, Calumet Marsh, Grass Lake); southern Minnesota (Faribault, Waverly, Heron Lake); northern Iowa (Hancock County); southern South Dakota (Vermilion, Scotland, Running Water), and northern Nebraska (Kennedy, Hay Lake); accidental near Kansas City, Mo.; abundant in Montana and rare in Wyoming (Lake Desmet), Colorado (Larimer County), and probably Arizona (Mormon Lake); common in British Columbia, and rare and local through Washington (Mabton) and Oregon (Rock Creek Sink) to southern California (Alamitos). The northern limit of the breeding range extends from the Arctic coast northwest of Hudson Bay west to Alaska and the Siberian coast.

The pintail breeds in the northern portions of the Old World and migrates south in winter to northern Africa and southern Asia. A few have been taken in the Bermudas in the fall and winter.

Winter range.—The pintail is common in winter on the coast of North Carolina, and is not uncommon coastwise as far south as Florida; many spend the winter in Cuba, a few pass to Jamaica, and there is one record of the species in Porto Rico; it is one of the common winter ducks from Mexico to Costa Rica, rare in Panama; a few winter as far north as Pennsylvania and New Jersey, while accidentals in winter have been recorded from Long Island and Lynn, Mass. Only a few winter in the Mississippi Valley north of southern Illinois, and thence the winter home extends through Texas, New Mexico, and Arizona to the Pacific coast, where it is abundant at this season as far north as southern British Columbia. The species winters casually in southern Ohio and southern Indiana, while of late years it has become a regular local winter resident in southern Wisconsin.

Spring migration.—The pintail vies with the mallard in the earliness of its spring movements; these two, with the Canada goose, are among the first of the waterfowl to wing their way northward. Even in February, while winter still holds sway, restless adventurers appear in much of the region, which, except in a few favored spots, forbids residence through the winter. The average date of arrival of these birds in central Indiana (fourteen years) is February 21; southern

Illinois (twelve years), February 26; central Missouri (fourteen years), February 26; Keokuk, Iowa (fourteen years), February 18; central Kansas (seven years), February 21; southern Nebraska (five years), February 23. Farther north average dates of arrival are Erie, Pa., March 11 (earliest February 23, 1891); northwestern New York, March 25 (earliest February 25, 1902); southern Ontario, April 18; Ottawa, Ontario, April 30; Montreal, April 23; Prince Edward Island, April 24. The late arrival of this species in eastern Canada is noteworthy, for by the time it reaches there, late April, in the interior it has penetrated a thousand miles farther north. Along this latter route average dates of appearance are southern Michigan, March 18; vicinity of Chicago (thirteen years), March 20 (earliest March 12, 1893). The normal time of arrival in central Iowa, as deduced from copious records for twenty years, seems to be March 6, but in twelve of these years one station or another reported unusually early birds, the average date of arrival of which is February 21. The average date when southern Minnesota is reached is (fourteen years) March 9 and northwestern Minnesota (four years) April 8. On the plains the average dates are, northern Nebraska, March 5; southern South Dakota, March 8; central South Dakota, March 17; Larimore, N. Dak., April 3 (earliest March 20, 1889); Reaburn, Manitoba, April 8 (earliest April 5, 1900); Qu'Appelle, Saskatchewan, April 10 (earliest March 25, 1905); Great Slave Lake, Mackenzie, about May 1; Fort Confidence, May 22, 1849. A very early bird was seen at Fort Simpson, Mackenzie, April 28, 1904. Nearer the Rocky Mountains, the average date at Terry, Mont., was April 1 (earliest March 10, 1902); Great Falls, Mont., March 16 (earliest March 10, 1889); Edmonton, Alberta, April 7, 1887; St. Michael and Nulato, Alaska, about May 1; Kowak River, Alaska, May 14, 1899; Point Barrow, Alaska, June 18, 1882.

The pintail not only migrates early, but it is also among the earlier ducks to breed, as evidenced by the following data: Will, Ill., eggs, May 10, 1877; Calumet Marsh, Illinois, fresh eggs, May 29, 1875; Hancock County, Iowa, eggs, May 1, 1879; Hay Lake, Nebraska, half-grown young, June 17, 1902; North Dakota, eggs, early May, young, first week of June; Oak Lake, Manitoba, incubated eggs, May 24, 1892; near Lake Athabasca, eggs nearly hatched, June 8, 1901; Nulato, Alaska, beginning to breed May 20; Circle City, Alaska, downy young, July 10, 1903; Kowak River, Alaska, first eggs, June 1, 1899.

Fall migration.—As is true of most ducks, there is a southward movement in August, but it is not until early September that many appear south of the breeding grounds, and in the course of two weeks a few birds find their way even to the Gulf of Mexico, arriving there by the middle of September. Some early dates are: Erie, Pa., September 6, 1893; Alexandria, Va., September 13, 1890; Long

Island, September 15, 1903; Rhode Island, September 4; eastern Massachusetts, September 11; Montreal, September 3. The main flight is a whole month later, bringing the birds in large numbers to Chesapeake Bay the middle of October and to the coast of North Carolina late in that month. Some very early migrants have been seen in west central Texas September 4; at Corpus Christi, Tex., August 18, 1902, and at the southern end of Lower California, August 29. The last ones leave the Arctic just about the time the first reach the Gulf of Mexico; the last were noted at Point Barrow, Alaska, September 7, 1882; Kowak River, Alaska, September 14, 1898; St. Michael, Alaska, October 10; Fort Franklin, Mackenzie, September 27, 1903. Large flocks begin to leave southern Minnesota the middle of October, and most have departed by the first of November.

[**Pœcilonetta bahamensis** (Linn.). Bahama Duck.

This duck is among the species that range most widely in the Western Hemisphere. It is strange that it should not have been detected in Florida, for it occurs throughout the Bahamas, even in the most northern islands. Thence it ranges through the Greater and the Lesser Antilles to South America. In Brazil it is one of the most abundant ducks and occurs in decreasing numbers even south to the Falkland Islands. It has been recorded from every country of South America except Colombia, Venezuela, and Ecuador. It breeds throughout its range from the Bahamas to the Falklands.]

Aix sponsa (Linn.). Wood Duck.

Breeding range.—The wood duck is more closely confined to the United States than any other North American duck. South of this country it is not a rare resident in Cuba and is accidental in Jamaica and the Bermudas. It occurs in California south to Los Angeles and Ventura counties, in the latter of which it breeds. There is a single record for Mexico, at Mazatlan. It breeds in eastern Texas, south rarely to San Antonio; thence to the Pacific slope and north throughout the whole Rocky Mountain region it is rare or accidental. It is recorded as breeding in southwestern Colorado (Fort Lewis), northern Idaho (Fort Sherman), northern Montana (Flathead Lake), and as a rare migrant in various localities south to New Mexico and Arizona.

The northern extension of its range is found in Nova Scotia and New Brunswick, for the species is not yet recorded from Newfoundland, and there seems to be no reliable record for Labrador. It ranges at least as far north as Montreal, Ottawa, Moose Factory, Trout Lake, and Cumberland House. It appears to be absent from the Rocky Mountain region of Canada, but occurs in southern British Columbia (Agassiz, Sumas, Chilliwack, and Burnaby Lake).

It is one of the earliest ducks to breed, as young were found in northern Florida on March 19, 1877.

Winter range.—The southern range in winter has already been given; northward the species winters regularly to North Carolina, occasionally in Maryland and Pennsylvania; accidentally in New York and Massachusetts. In the interior it is found at this season as far north as southern Indiana, southern Illinois, and Kansas. On the Pacific coast a few winter near the northern limit of the summer range.

Spring migration.—This duck is one of those which migrate north moderately early, and in central New York the average date of its arrival is March 25 (earliest March 16, 1898); eastern Massachusetts, March 24; Montreal, Canada, April 24; central Iowa, March 20 (earliest March 7, 1898); northern Ohio April 1 (earliest March 10, 1887); Petersburg, Mich., March 15; southern Ontario, April 17 (earliest April 1, 1890); Ottawa, Ontario (average fifteen years), April 22 (earliest March 26, 1898); Heron Lake, Minn., April 4 (earliest March 24, 1890); Elk River, Minn., April 6 (earliest April 4, 1885); southern Manitoba, April 15 (earliest April 2, 1895.)

Fall migration.—The southward migration amounts to no more than withdrawal from the northern half of the summer range. This occurs largely during October, and the average date when the last migrants are seen at Ottawa, Ontario (fourteen years), is October 27 (latest November 7, 1896); Montreal, November 1; southern Maine, October 27 (latest November 2, 1896); southern Iowa, November 9 (latest November 21.)

[**Cairina moschata** (Linn.). Muscovy Duck.

In its domesticated form this duck is well known throughout the civilized world. In its wild state it is an abundant inhabitant of Middle and South America from Tampico, Yucatan, Mazatlan, and the Rio Zacatula in Mexico to central Argentina. There is no certain record of its occurrence in the United States nor in the West Indies, although a supposed hybrid between the muscovy and the mallard was described from Jamaica under the name of *Anas maxima*, and similar birds have been taken several times along the Atlantic coast of the United States. Probably all these escaped from domestication.]

Netta rufina (Pall.). Rufous-crested Duck.

This is a European and Asiatic species, one specimen of which was found in 1872 in the New York City market.

Aythya americana (Eyt.). Redhead.

Breeding range.—The greater number of redheads summer in a rather restricted area in western central Canada, comprising western Manitoba, Alberta, and Saskatchewan. The species breeds not rarely in the northern portions of Minnesota, North Dakota, and Montana. It is less common in southern Minnesota (Madison, Heron Lake), southern South Dakota (Harrison, Vermilion), Idaho (Lake Hoodoo), and on the Pacific slope locally from Lac la Hache, British Columbia, south to southern California (Ventura and Los Angeles counties), and east to Ruby Lake, Nevada, and Rush Lake, Utah. The redhead used to breed not uncommonly in the great marshes of the lake region of southeastern Wisconsin, but now it is restricted to a few localities, one of which is Lake Koshkonong. It has bred on the St. Clair Flats of Michigan and Ontario.

Only a few pass as far north as 54° latitude, the northern range of the species thus being more restricted than that of any other Canadian duck. A stray was taken in 1896 on Kadiak Island, Alaska, the only record on the Pacific coast north of Vancouver Island, and an individual was taken in the fall in southeastern Labrador. It is not yet recorded in Newfoundland, and is a rare migrant in the Maritime Provinces.

Winter range.—The principal winter home of the redhead is from Texas, along the Gulf and Atlantic coasts, to Chesapeake Bay; a few winter on Long Island, and a still smaller number around Cape Cod and Lakes Ontario and Erie; the species winters in the Mississippi Valley north to Illinois and Kansas, and in the West to New Mexico, Arizona—rarely Utah—Nevada, and southern British Columbia, almost as far north as it breeds. The redhead is not uncommon in winter in the Valley of Mexico, but is quite rare on the west coast south to Manzanillo and southern Lower California. It is accidental in Jamaica.

Spring migration.—The redhead moves north with the great body of river ducks soon after the first open water appears. Average dates of arrival are: Oberlin, Ohio, March 10 (earliest March 4, 1904); central Indiana, March 13 (earliest March 6, 1887); southern Ontario, March 24 (earliest March 14, 1898); Keokuk, Iowa, March 7 (earliest February 13, 1898); central Iowa, March 18 (earliest, March 8, 1887); southern Wisconsin, March 30 (earliest March 10, 1898); Heron Lake, Minn., March 26; central Nebraska, March 10 (earliest February 10, 1896); northern Montana, April 13 (earliest April 7, 1895); southern Manitoba, April 21 (earliest April 12, 1903). Eggs have been found in southern California in May; at Horicon Lake, Wisconsin, May 24; in northern North Dakota, June 1; at Rush Lake, Saskatchewan, June 15.

Fall migration.—The movement of the redhead exhibits in extreme degree a phase of migration, shared to a lesser extent by several other species, in which the course taken is at a wide angle from the normal southern one. Lake Winnipeg marks the extreme northeastern part of the district where it breeds commonly, and yet the species is a fairly common fall migrant along the Atlantic coast from Cape Cod southward. The individuals that visit Cape Cod take an almost eastern course, or at least go 3 miles east for every mile south. From the nearest breeding grounds to the lower Hudson Valley, which is about as far north as the species occurs regularly in large numbers, the course is almost at right angles to the general trend of the Atlantic coast line. In other words, this is the course the redhead should take to reach salt water by the shortest route. This route from Manitoba to Long Island is through a district abounding in shallow lakes and marshes, which furnish abundant food. After reaching the coast, most of the redheads pass southward and winter from Chesapeake Bay to Florida and the Bahamas. Only a portion of the species, however, takes this east and west course. Many flocks pass directly south and are common all through the Mississippi Valley to the Gulf coast and through Texas to central Mexico. The average date when the first migrants appear in southern Ontario is September 19 (earliest September 10, 1896); at Erie, Pa., the average date is October 7, while at Alexandria, Va., a long series of careful records fixes October 12 as the average date of arrival—October 5 (1901) the earliest—and October 29 as the average date when the species becomes common. In general it may be said that the large flocks cross into North Dakota about the 1st of October, are common in the central Mississippi Valley about the middle of the month, and reach the Gulf coast, from Texas to Florida, early in November, when the last are deserting the northern breeding grounds.

A single individual was seen in southeastern Labrador, September 23, and this bird must have journeyed nearly 2,000 miles in a due easterly direction.

Aythya vallisneria (Wils.). Canvasback.

Breeding range.—The district just east of the Rocky Mountains in Alberta seems to be a center of abundance of this species in the breeding season. East of this district it breeds commonly to about the one hundredth meridian; south to the southern boundary of Canada, west to central British Columbia and Sitka, north to Great Slave Lake, and northwest to Gens de large Mountains and Fort Yukon. It does not commonly breed in the United States, but a few nest in northern North Dakota and in diminishing numbers southward to Nebraska (Cody, Irwin, Hackberry Lake); it is rare as a breeder in Minnesota (Madison, Heron Lake), and a few crippled birds have been known to breed on Lake Koshkonong, Wisconsin. In 1900 it bred casually at Barr Lake, near Denver, Colo., and it has been known to breed at Pyramid Lake, Nevada, and in a few places in Oregon.

Winter range.—The statements of the breeding range just made show that the eastern edge of the regular summer home is more than a thousand miles west of Chesapeake Bay, which, until a comparatively recent period, was a favorite winter home for the canvasback. The line of the Great Lakes seems to be the general route followed in this southeastward migration, and a few canvasbacks stop for the winter as far north as Lake Erie and western New York. To the northward of Chesapeake Bay the numbers decrease rapidly until Long Island is reached, where the bird is rare. It is hardly more than a straggler in Massachusetts and is accidental in Maine, New Brunswick, and Nova Scotia. It has not been recorded as yet from Newfoundland, Labrador, or the Hudson Bay region.

The great flocks that formerly covered Chesapeake Bay are of the past, but a few still winter on the coast of the Carolinas. Accidentals are recorded from the Bermudas, from Cuba and Jamaica, and one from Guatemala. These seem to be all the records south of the Valley of Mexico, where it is not rare in winter. The winter range extends from this district and Mazatlan on the western coast, north to southern Illinois, Colorado, Nevada, and southern British Columbia.

Spring migration.—In February a few move north, bringing the van the latter part of that month to about latitude 39° in the Mississippi Valley, which is the northern limit of the species in mild winters. Early March brings the species to southern Iowa. Average dates of spring arrival are: Keokuk, Iowa, March 12; central Iowa, March 15; southern Wisconsin, March 26; Heron Lake, Minn., March 28 (earliest March 19, 1889); central Nebraska, March 14; northern North Dakota, April 18; southern Manitoba, April 21 (earliest April 6, 1885). In the interior of British Columbia eggs have been found May 21; in North Dakota, May 18; at Great Slave Lake, June 4, and Fort Yukon, June 3.

Fall migration.—In the day of the great flights to Chesapeake Bay the gunners did not expect large flocks of canvasbacks much before the middle of November, but a small number appeared some time earlier. For the last sixteen years the average date of the first arrival at Alexandria, Va., has been October 21 (earliest October 15, 1903). On the average canvasbacks have become tolerably common by November 8; in 1888 by the last of October. These flocks cross Lake Erie early in October, and the height of the shooting season there is toward the end of that month. The first flocks cross the boundary to the upper Mississippi Valley the last week in September and during the month of October spread gradually south to the southern limit of the range in the Valley of Mexico. Southern California is reached about October 20. In 1895 the last were seen at Heron Lake, Minnesota, on November 27.

Aythya marila (Linn.). Scaup Duck; Broadbill; Blackhead; Bluebill.

Breeding range.—The principal summer home of the scaup in the Western Hemisphere is northwestern North America, from northern North Dakota, southeastern British Columbia, and Sitka, Alaska, north to Fort Churchill, Great Slave Lake, Fort Reliance, Alaska, and Kotzebue Sound; also throughout the whole Aleutian chain to the

Near Islands. It breeds accidentally or casually at Mount Vernon, Va., 1881; Magdalen Islands, Gulf of St. Lawrence; Toronto, Ontario; St. Clair Flats, Michigan; Clear Lake, Iowa; Minneapolis and Fergus Falls, Minn.; and Great Whale River, James Bay.

The species also breeds in the arctic regions of the Old World, and winters south to southern Europe and central Asia.

Winter range.—This is one of the principal game birds of the Atlantic coast region from Massachusetts to Chesapeake Bay, and it is probably more common here during the winter than in any other part of its range. The winter range on the Atlantic coast of this and the next species is complementary. The present species is common from Chesapeake Bay northward, while most of the lesser scaups winter south of that district and are most common from North Carolina to Florida. A small proportion of the flocks of the greater scaup pass south to the Carolinas and a few continue on to Florida and the Bahamas. The records for the West Indies seem to belong to the lesser scaup and the same is probably true of the few records for Mexico and Central America.

The species winters regularly on the New Jersey coast and usually on Long Island; its stay in Massachusetts is governed by winter conditions, and during mild winters like those of 1891–92, 1893–94, and 1903–4, it is quite common along the southeastern coast. Occasionally some scaups winter even on the coast of Maine. It occurs throughout the Mississippi Valley in winter north to southern Wisconsin and Toronto, Ontario, though it is hardly more than a straggler in winter north of the Ohio River.

The greater scaup ranges nearly to the southwestern boundary of the United States in southern Texas, southern New Mexico, central Arizona, and to San Diego, Cal. A few winter in southern Colorado, southern Utah, and more commonly in Nevada, and on the Pacific coast north to the Aleutian Islands.

Spring migration.—Few birds have a more pronounced northwest and southeast migration than the greater scaup duck. Its center of abundance in winter is on the Atlantic coast between the meridians of 74° and 76° longitude, but almost all of these Atlantic coast birds breed west of the meridian of 95° longitude, and their route in spring is along the general direction of the chain of lakes that stretches almost due northwestward from Lake Erie to Great Slave Lake. The two routes of migration—south along the Mississippi River and southwest to the New England coast—are revealed still more clearly in the fall, when this species scarcely occurs in Indiana, though common both to the east and west of that State. In spring some of the flocks move north along the coast, slightly beyond their winter home, to eastern Massachusetts, but so large a proportion of them turn inland that the species is rare to the northeastward of this State, straggling to Newfoundland, and once recorded on the eastern coast of Labrador. Average dates of spring arrival are: Montreal, Canada, April 15 (earliest April 7, 1893); Oberlin, Ohio, March 24 (earliest March 9, 1904); central Indiana, March 17 (earliest March 1, 1892); northern Illinois, March 23 (earliest March 6, 1894); southern Ontario, March 30; southern Michigan, March 29; southern Wisconsin, March 13; central Iowa, March 16; Heron Lake, Minn., April 2; southern Manitoba, April 16 (earliest March 31, 1892); in 1905 one was seen March 27 at Indian Head, Saskatchewan, nearly a month earlier than usual. The species was seen May 24, 1901, at Fort Chipewyan, Alberta, and the first was noted May 24, 1904, at Fort Simpson. Its arrival has been noted at Fort Reliance, Yukon, May 1; at St. Michael, Alaska, May 8–10, and on the Kowak River, Alaska, June 1, 1899.

In most seasons about Long Island the last week of March marks the disappearance of the large flocks. Some years they remain during the first few days of April, and the last linger until about the 1st of May.

Eggs have been taken at Minneapolis, Minn., May 13; Oak Lake, Manitoba, May 24, 1892; Kowak River, Alaska, June 14, 1899; St. Michael, Alaska, end of May.

Fall migration.—Soon after the first of October, flocks of 'broadbills' begin to appear near Long Island and the numbers increase all through this month. September 26 is the average date when the first scaups arrive. Early arrivals, on the average, reach Alexandria, Va., October 18, and the species becomes common about the 1st of November. October is the month of arrival for this species throughout most of its winter range in the United States, and the early part of this month is the time of departure from the most northern breeding grounds. The last leave St. Michael, Alaska, October 7 to 15. The last leave Montreal, on the average, November 9 (latest November 14, 1896); the latest was seen at Heron Lake, Minn., November 27, 1885.

Aythya affinis (Eyt.). Lesser Scaup Duck.

Breeding range.—In the case of this species a distinction needs to be drawn between the breeding range and the summer range. Quite a number of nonbreeding individuals spend the summer many miles south of the nesting grounds, so that the eggs or young are the only certain evidence that the species breeds. These nonbreeding birds are not rare on the New England coast, Long Island Sound, and the Great Lakes. The lesser scaup does not breed regularly in northeastern United States nor in any of the Maritime Provinces; indeed, there is scarcely a breeding record for the whole of North America east of Hudson Bay and Lake Huron. The extreme easterly points at which the species breeds are around Lake St. Clair and the western end of Lake Erie in Ohio, Michigan, and Ontario; thence westward, a few breed in northern Indiana (Kewanna, English Lake), southern Wisconsin (Delavan, Lake Koshkonong), northern Iowa (Spirit Lake, Clear Lake), northern Nebraska (probably in Cherry County), Montana (common), and central British Columbia (Cariboo district). The species is rather rare on the Pacific coast and seems to have been found only once on the coast of Alaska (Portage Bay, near Chilkat River), though not rare inland on the Yukon River, breeding as far north as Circle City. The principal breeding range of the lesser scaup is the interior of Canada, from northern North Dakota and northern Montana to the edge of the timber near the Arctic coast in the Anderson River and the Mackenzie River regions.

Migration range.—The route of migration in the fall evidently tends toward the southeast, for at this season the species is not uncommon in New England, and is a rare visitant of Nova Scotia and even of Newfoundland, and is accidental in Greenland and the Bermudas.

Winter range.—The southeastward movement just mentioned brings a large number of lesser scaups to the South Atlantic States, from Maryland southward; indeed, in Florida it is one of the commonest ducks, and continues to be common as far south as the Bahamas, the Greater Antilles, and east to St. Croix, St. Thomas, Virgin Gorda, St. Lucia, and Trinidad. It is not rare in Panama and Costa Rica, while it is abundant in Guatemala, Yucatan, Mexico, and Lower California, and less common on the Pacific slope north to southern British Columbia. The species remains north in winter, on the Atlantic coast as far as New Jersey and Pennsylvania, and in the interior as far as southern Illinois, southern Colorado, and Arizona. There are a few records of its occurrence in winter in western New York.

Spring migration.—An abundant migrant in the upper Mississippi Valley, the lesser scaup is one of the less early ducks to arrive. It has appeared at Keokuk, Iowa, just north of its winter home, on February 26, average of five years (earliest date February 21, 1892); while during another period of five years the average date of its arrival was March 19. The average date of arrival in central Iowa is March 21, as deduced from thirteen years' observations; at Heron Lake, Minn., March 22 (earliest March 5, 1887); central Nebraska, March 29; Loveland, Colo., March 12 (earliest March 8, 1887). The average of six years' observations at Chicago, Ill., gives April 6 as the date of appearance, while in a neighboring locality, English Lake, Ind., it has been taken several times by March 12, and in 1892 on March 6. The average dates are: Central Indiana, March 27; Oberlin, Ohio, March 23 (earliest March 15, 1901); southern Michigan, March 25 (earliest March 11, 1905); Ottawa, Ontario, April 26; Montreal, Canada, April 14; Reaburn, Manitoba, April 9. This species was seen near Pelican Rapids, Alberta, May 7, 1901, and at Fort Simpson, Mackenzie, May 24, 1904. It is one of the later breeding ducks. Young were seen at Mitchells Bay, Ontario, June 6, 1888; eggs at Rush Lake, Saskatchewan, May 28, 1892; and eggs on the lower Anderson June 17, 1865.

Fall migration.—The species remains on its breeding grounds until quite late in the fall, and in the United States rarely becomes numerous before the 1st of October. At Alexandria, Va., the average date of arrival (ten years) is October 12 (earliest, September 25, 1903) and the average date on which it becomes common is October 27. In 1902 the first arrival in northern Florida was seen November 18, and about this date it appears in the Bahamas and in southern Lower California. It is one of the last of the river ducks to leave the far north, and in 1903 was seen at latitude 64° on the Mackenzie River until the middle of October. Average dates when the last were seen are: Montreal, Canada, November 5 (latest, November 12, 1894); Ottawa, Ontario, November 11 (latest, November 21, 1892); southern Manitoba, November 8; southern Minnesota, November 13; Keokuk, Iowa, December 2.

Aythya collaris (Donov.). Ring-necked Duck.

Breeding range.—The summer home of this species seems to comprise two general areas separated by the Rocky Mountains. The greater number breed in the interior, from North Dakota and Minnesota north to Athabasca Lake and east to the western side of Lake Winnipeg. It breeds rarely south to southern Minnesota (Minneapolis, Heron Lake), northern Iowa (Clear Lake), and to southern Wisconsin (Lake Koshkonong; Pewaukee Lake). Though eventually the species may be found breeding in Alberta, at present there seems to be no certain nesting record for the entire Rocky Mountain chain from New Mexico to Alberta. West of the Rockies the ring-necked duck seems to breed in small numbers from Fort Klamath, Oreg., to southern British Columbia (Cariboo district). It is said to breed also on the Near Islands, Alaska.

Winter range.—The Gulf coast, from Florida to Texas, is the principal winter home of the ring-necked duck, and here locally it is the most abundant duck at this season. It is common also in the Bahamas and Cuba, rare in Jamaica, and has been noted once in Porto Rico, and once in the Bermudas. On the mainland it is rare in California and Lower California, common in Mexico, and ranges to central Guatemala. Northward it is common in the Carolinas, rare to Maryland and New Jersey, and thence westward to southern Illinois, northern Texas, New Mexico, and north on the Pacific coast to southern British Columbia.

Spring migration.—Along the Atlantic coast from Massachusetts northward to Newfoundland this species is a rare migrant, and is one of the later ducks to move. The average date of arrival at Erie, Pa., is April 16 (earliest March 15, 1903). The migration in the Mississippi Valley is somewhat earlier; average dates are: English Lake, Ind., March 11 (earliest February 27, 1892); Keokuk, Iowa, March 14 (earliest March 4, 1894); Heron Lake, Minn., March 27 (earliest March 15, 1894). The first arrival was noted at Osler, Saskatchewan, May 2, 1893, and at Fort Chipewyan May 22, 1893. Eggs have been taken at Pewaukee Lake, Wisconsin, May 20, 1867; Minneapolis, Minn., May 27, 1876; Turtle Mountain, N. Dak., June 14, 1898; Rush Lake, Saskatchewan, June 15, 1892.

Fall migration.—Southward migration in the Mississippi Valley is earlier than it is along the Atlantic coast; in the former the bird reaches the Gulf coast about the middle of September, and has been noted in the Valley of Mexico September 28; along the Atlantic it appears at Alexandria, Va., on the average, October 23 (earliest arrival October 6, 1901), and it becomes common at an average date of November 11. It was seen near Athabasca Landing September 4, 1903. The average date when the last migrants were seen at Ottawa, Ontario, was October 30 (latest November 21, 1892); latest in Massachusetts November 23; Erie, Pa., December 3, average date of the last arrivals in southern Minnesota (eight years) November 13.

Clangula clangula americana (Bonap.). American Golden-eye.

Breeding range.—This is one of the more northern-breeding ducks, but its choice of hollow trees as nesting sites prevents the extension of its breeding range into the treeless Arctic regions, to which it seems well suited by its hardy constitution. It has been noted north to Ungava Bay, Labrador; Fort Churchill, Hudson Bay; and Fort Good Hope, near the mouth of the Mackenzie River. It is probable that the species breeds in the heavy timber nearest to these places. In Alaska it breeds commonly in the interior about as far north as the Arctic Circle, but is very rarely seen on the coast. The species breeds from Newfoundland to British Columbia, north to the Noatak River, but the breeding range extends only a little into the United States, to southern Maine (Calais, Magalloway River), northern New Hampshire (Lake Umbagog), northern Vermont (St. Johnsbury), northern New York (Adirondacks), northern Michigan (Neebish Island, Sault Ste. Marie), North Dakota (Devils Lake), Montana (Flathead Lake), and in British Columbia so close to the southern boundary that the species will probably be found to breed in northern Washington.

The typical form, *Clangula clangula*, breeds in northern Europe and northern Asia, migrating southward to northern Africa and southern Asia.

Winter range.—As this is one of the hardiest ducks, its northern distribution in winter is governed by the presence of open water. It is tolerably common on Lakes Michigan, Erie, and Ontario, and in mild winters, as that of 1888–89, it remains north to Prince Edward Island. It is common in winter all along the New England coast, and continues to be common to North Carolina, less common in South Carolina, and rare or accidental to the southward. All records for the West Indies seem to be erroneous. It was once seen at sea near the Bahamas, has been taken a few times in the Bermudas, and has been seen a few times in Florida; it is not rare at the mouth of the Mississippi River, but is quite rare in Texas and New Mexico, is recorded in Mexico (Mazatlan and northeastern Lower California), and is rare in southern California. In the interior it remains during the winter north to Iowa, Nebraska, and Utah, while on the Pacific coast it is found at this season north to the Aleutian Islands.

Spring migration.—The spring records of this species are very irregular, as might be expected from its habit of wintering far north near large bodies of water. Observers on the coast of Maine report it as common all winter, while inland in southern Maine the first was not seen (average eight years) until April 5 (earliest March 27, 1902); at Montreal, Canada (average nine years), April 4 (earliest March 19, 1894); North River, Prince Edward Island, April 8, and at Lake Mistassini, Quebec, May 3, 1885. At Ottawa, Ontario, it was one of the most irregular birds in its arrival. In twelve years out of eighteeen the first arrival was not noted until April, average April 12; for five years the first came in March, and in 1885 the first was seen February 14. Other average dates of arrival are: Southern Ontario, April 5; northern Iowa, March 21; Heron Lake, Minn., March 25 (earliest March 14, 1889); northern North Dakota, April 20; southern Manitoba, April 21 (earliest March 29, 1902). The first golden-eyes have been noted at Great Falls, Mont., March 9–22; central Alberta, April 7–17; Osler, Saskatchewan, May 2, 1893; Fort Resolution, Mackenzie, May 7, 1860, and Nulato, Alaska, May 3, 1868. An unusually early bird was seen on April 28, 1904, at Fort Simpson, Mackenzie. Eggs have been taken at Devils Lake, N. Dak., May 25, 1903; near Lake Athabasca June 6, 1903; downy young at Reaburn, Manitoba, July 4, 1893, and well-grown young June 23, 1894, near Ottawa, Ontario.

Fall migration.—The golden-eye is one of the late ducks to migrate southward, seldom appearing south of its breeding range before October and usually not until the latter part of that month. A long series of excellent notes at Alexandria, Va., shows the average date of arrival to be October 26 (earliest, October 8, 1901); on the average the species did not become common until November 11. The average date of appearance at Woods Hole, Mass., is November 15 and at Keokuk, Iowa, November 24. The average date when the last were seen at Montreal, Canada, is November 7.

Clangula islandica (Gmel.). Barrow Golden-eye.

Breeding range.—A few breed in eastern Canada from the Gulf of Saint Lawrence (Point des Monts) to northern Labrador (Davis Inlet). A few are found in Greenland during March and April and in November and December as far north as Holstenborg, 67° latitude, but the species apparently does not breed there, though breeding quite commonly in Iceland. The principal summer home is in the Rocky Mountains, where the species breeds from southern Colorado (Dolores County) north almost to the Arctic coast (Fort Anderson), though north of the United States there are only a few records in the entire district. On the Pacific slope the species breeds quite commonly in central British Columbia and less commonly north to Lake Clark, Alaska. The most southern record of breeding on the Pacific slope seems to be the one made by one of the parties of the Biological Survey at Paulina and Diamond lakes, Oregon.

Winter range.—The larger number of the breeding birds of eastern Canada spend the winter around the Gulf of St. Lawrence, but a few straggle south and have been recorded at this season from Maine, New Hampshire, Massachusetts, New York, Virginia, and on four occasions from North Carolina. In the interior they have been recorded a few times in the States around the Great Lakes and even in Nebraska. The Rocky Mountain breeding birds pass in winter scarcely south of their summer range and are found from southern Colorado (Fort Lewis) to Montana (Fort Sherman and Great Falls). The Pacific birds winter from southern Alaska (Portage Bay) to California (San Francisco).

Spring migration.—Records of this species are too few to allow of exact statements in regard to its migration; indeed, over most of the range of the species the winter and summer homes overlap. Migrants were noted at Quebec City, April 14, 1899, and April 16, 1904. One was seen near Asheville, N. C., in 1893 as late as May 6. One was taken at Fort Anderson, Mackenzie, June 14, 1864.

In Iceland the species begins breeding in May or early June. At Godbout, Quebec, young were found July 11, 1881. Incubated eggs were taken June 17 in central British Columbia.

Fall migration.—The earliest fall migrants in 1897 at Montreal were seen October 23. One was taken near Washington, D. C., November 22, 1889, and one at Lake Koshkonong, Wisconsin, November 14, 1896.

Charitonetta albeola (Linn.). Buffle-head.

Breeding range.—In the nesting season the buffle-head is almost wholly confined to Canada, but a few breed in Wisconsin (Pewaukee Lake), northern Iowa (Storm, Clear, and Spirit lakes), Wyoming (Meeteetse Creek), Montana (Milk River, Flathead Lake). It is a tolerably common breeder in the northern two-thirds of Ontario, and undoubtedly some pairs breed in Quebec and southern Labrador, though it is as yet unrecorded from there, from the Maritime Provinces, and from Newfoundland, except as a rather rare visitant. In Manitoba and westward to British Columbia it becomes more common as a breeder, and ranges north to Fort Churchill, Fort Rae, the mouth of the Mackenzie, and the upper Yukon, rarely to the Yukon mouth. It has been taken as a rare straggler on the west coast of Greenland (Godhaven, October; Frederikshaab), and a few times in Europe.

Winter range.—A single specimen was found in the market at Habana, and this constitutes the only record south of the eastern United States. To the westward a few enter Mexico to the Valley of Mexico and Lower California to San Quentin. It is a common winter resident of the southern half of the United States, north to Massachusetts; Lakes Ontario, Huron, and Michigan; Utah, Idaho, British Columbia, Unalaska Island, and the Near Islands. It is casual in winter in the Bermudas and there is one record from the Commander Islands, Kamchatka.

Spring migration.—As with most of the hardy ducks, spring migration begins in February, and by the middle of March the buffle-head is fairly common in the district where it winters only locally and during exceptionally mild seasons. Average dates of arrival are: Renovo, Pa., March 18 (earliest February 29, 1904); New Brunswick and Nova Scotia, March 22; central Indiana, March 2; northern Illinois, March 21; southern Michigan, March 31 (earliest March 1, 1887); southern Ontario, April 7 (earliest April 1, 1903); Ottawa, Ontario, April 24 (earliest March 26, 1898); southern Iowa, March 22 (earliest March 1, 1891); Heron Lake, Minn., March 26 (earliest March 6, 1889); southeastern Minnesota, April 5; Elk River, Minn., April 11; central South Dakota, April 8; southern Manitoba, April 25; Osler, Saskatchewan, May 2, 1893; Fort Simpson, Mackenzie, May 11, 1904. Eggs have been taken at Fort Simpson May 25, 1860, and at Fort Yukon, June 7, 1862.

Fall migration.—This species is late in entering the United States, September records being rare, except in the extreme northern part, and even here the species is scarcely common before the middle of October. At Renovo, Pa., the average date of arrival is November 10, though in 1901 the first was seen September 21. The average date of the last migrants at Montreal was November 1, and at Ottawa, Ontario, November 8. One was taken at Fort Reliance, on the upper Yukon, October 7.

Harelda hyemalis (Linn.). Old-squaw.

Breeding range.—The summer home of this species includes the Arctic coasts and most of the islands. It is abundant to the northern part of Banks Land and thence east to North Somerset Island and the south shore of Lancaster Sound—that is, to about latitude 74°. On the western coast of Greenland it is common to about latitude 72°. A few pass much farther north to Melville Island, Wellington Channel, and along the whole western coast of Greenland and on Grinnell Land to at least latitude 82°. The old-squaw breeds south to the southeastern coast of Labrador, to Cape Fullerton on the west side of Hudson Bay and probably to Cape Jones on the eastern coast. Along the whole coast of the mainland from Hudson Bay to Alaska it breeds in enormous numbers, and is a common breeder on the Alaskan coast to the Aleutian and Near islands and on the Asiatic coast to the Commander Islands. The species breeds in the Arctic regions of the Old World and winters south to southern Europe and central Asia.

Winter range.—Old-squaws are common south to Chesapeake Bay and not rare as far south as the coast of North Carolina. So abundant are they on the New England coast that near Newport, R. I., in February, 1899, a flock was seen that was estimated to contain at least 50,000. During the winter of 1887–88, a few were noted at Charleston, S. C., and during the severe winter of 1894–95, flocks were seen off the coast of South Carolina. There are two records for Florida—near Titusville and in Leon County. In mild winters old-squaws remain in the Gulf of St. Lawrence, and some occur at this season in southern Greenland. They winter abundantly on the Great Lakes, and have been noted as casual visitors at St. Louis, Mo., April 1, November 20, and March 14; New Orleans, La., February 28, 1885, and February 13, 1899; Nebraska (Omaha, Neligh), Kansas (Patterson Lake, Gantz Mill), and Colorado (Fort Collins, Longmont, Denver). This species winters on the Pacific coast from the Aleutian Islands southward; it is tolerably common to the coast of Washington, and not rare to northern California; it is casual in southern California as far south as San Diego Bay.

Spring migration.—The principal movements of old-squaws along the New England coast are in April, and this is the time also when the species migrates through western Pennsylvania and western New York. The first of those that have moved south reappear at Grand Manan, New Brunswick, on an average date of March 9, and at Godbout, Quebec, April 22. North of its winter quarters it is one of the earliest ducks to arrive, and has been noted at Fort Simpson, Mackenzie, 62°, May 10, 1904; Winter Island, latitude 66°, May 3, 1822; Igloolik, latitude 69°, May 21, 1823; Boothia Felix, latitude 70°, June 12, 1830, June 20, 1831, about June 16, 1833, and not until after June 25, 1832; Prince of Wales Strait, latitude 75°, May 31, 1851; Mercy Bay, June 13, 1852; Winter Harbor, latitude 75°, June 22, 1820; Cape Sabine, latitude 78°, June 1, 1884; Van Rensselaer Harbor, latitude 79°, June 16, 1854; Fort Conger, latitude 81°, June 17, 1882, June 6, 1883; Floeberg Beach, latitude 82° 40′, July 12, 1876. The last usually leave the eastern United States about the 1st of May (Erie, Pa., May 18, 1900). The last were seen at Fort McMurray, Alberta, May 15, 1901. On the Pacific coast, the first old-squaws were noted at Chilcat, Alaska, March 11, 1882; off the mouth of the Yukon, stragglers usually arrive early in April as soon as open water appears; the main migration is several weeks later, and the first arrivals appear at Point Barrow late in May (May 18, 1882; May 24, 1883; May 31, 1898). The first reached the mouth of the Kowak River, Alaska, May 22, 1899.

Eggs have been taken at St. Michael, May 18; on the Pribilof Islands, June 12; near the Kowak River the last of June; Fort Anderson, Mackenzie, June 7, 1864, June 14, 1865; northwestern Hudson Bay, June 27; Ungava Bay, Labrador, June 16.

Fall migration.—Fall migration had already begun and large flocks had passed south to Great Bear Lake in 1903 by August 28, and were still numerous there September 17. An unusually early migrant was seen near Erie, Pa., September 13, 1876. Early dates are September 30, 1895, on the coast of Massachusetts, and October 8, 1885, on Long Island. The average date of arrival for six years on the coast of Massachusetts is October 11, and for nine years on Long Island, October 16. The birds are most abundant the first half of November, after which month the larger number pass on to more southern waters. The last were seen near northern Greenland, latitude 82°, September 16, 1875. Most leave Point Barrow in early October, but a straggler was seen there December 9, 1882. They leave the coast of Alaska, off St. Michael, from the 15th to the 20th of October.

Histrionicus histrionicus (Linn.). Harlequin Duck.

Breeding range.—The harlequin breeds commonly in Newfoundland and on the whole west coast of Greenland south of Upernavik, latitude 72°, on the east coast north to Scoresby Sound, and in Iceland; also along the north coast of Labrador, at Ungava Bay, and Hudson Strait. There is no reason for doubting that its breeding range is continuous from northern Labrador west to the mouth of the Mackenzie River, though breeding records from this region are wanting. The species was noted by one of the parties of the Biological Survey August 20 and 24, 1903, a short distance south of MacTavish Bay, Great Bear Lake, in latitude 65° 30′, where it was probably breeding. It has been taken also at Fort Rae, at Fort Simpson, and on Bear Lake River. It is known to breed from the mouth of the Mackenzie west to Kotzebue Sound and to the Siberian coast. It occurs in summer on most of the islands west of Alaska, south to the Shumagin Islands, and in the Aleutian chain west to the Near Islands and to the Commander Islands off the coast of Asia. Most, if not all, of these birds, however, are nonbreeders. It has been noted breeding at several localities in the interior of Alaska, and breeds locally throughout the mountainous region of western North America south to southwestern Colorado and to central California at about latitude 38°.

Winter range.—The harlequin is not rare at this season in the southern part of the Gulf of St. Lawrence, and thence is less common to Long Island Sound; it is accidental on the New Jersey coast, and once, March 20, 1886, has been noted at Pensacola, Fla. It is not uncommon in winter on Lake Michigan; an accidental was noted October 29 near St. Louis. It winters in Colorado at the southern limit of its breeding range but at several thousand feet lower altitude. On the Pacific coast it winters abundantly in the Aleutians and the Pribilof Islands; west to the Near Islands, the Commander Islands, and rarely to Japan; also along the coast of California to Monterey and in the interior to about 36° latitude (near Crockers Station). Accidental in Europe.

Spring migration.—The few individuals that winter on the Atlantic coast of the United States retire northward in January and early February, but some linger just south of the breeding grounds in the Gulf of St. Lawrence until late May. The species arrives on the coast of Greenland in March. On the Pacific coast the winter and breeding ranges so overlap that no regular progression northward can be distinguished. Migratory movements are noticeable on the coast of Oregon the last of March; the species was noted at Fort Simpson, Mackenzie, May 25, 1904; the van usually arrives at the mouth of the Yukon about the 1st of June.

Fall migration.—The first arrivals off the coast of Massachusetts do not appear until about the beginning of November, when the last are leaving the Greenland breeding grounds. The first arrivals have been noted at Toronto, Ontario, October 20, 1894, and at Omaha, Nebr. (accidental), September 16, 1893; September 19, 1895.

Camptolaimus labradorius (Gmel.). Labrador Duck.

This is an extinct species, which within the last century nested from Labrador northward. During the winter it visited the coast of New England and passed as far south as Long Island and New Jersey, possibly to Chesapeake Bay. So far as known the last survivor was captured in 1871 at Grand Manan, New Brunswick. Forty-three specimens are known to be in museums.

Polysticta stelleri (Pall.). Steller Eider.

Breeding range.—The principal summer home of this duck is along the northern coast of Siberia, where the species is enormously abundant. Thence it breeds on the eastern coast and islands south to the Near Islands, Unalaska, and the Shumagins. Eggs have been found at Unalaska May 18, in northern Siberia June 25, and downy young at Point Barrow, Alaska, July 28.

Winter range.—The Steller eider winters abundantly on the Near Islands and as far north as Unalaska, the Shumagins, and the Kenai Peninsula. The winter range extends south on the Asiatic coast to the Kurile Islands.

Spring migration.—The northward migration is limited chiefly to May. The first arrivals have been noted at Point Barrow June 5, 1882, June 11, 1883, June 9, 1898. During migration the species is fairly common along the coast of Alaska at Bristol Bay, the mouth of the Yukon, and in Norton Sound.

Fall migration.—The first arrival in the fall has been noted at St. Michael, Alaska, September 21. The southern limit of the winter home is reached about the 1st of November. The latest date at Point Barrow is September 17, and the last migrants leave St. Michael about the middle of October.

The Steller eider has occurred accidentally at Disco Bay, Greenland, in the fall of 1878; at Godbout, Quebec, February 17, 1898, and also at Point des Monts, Quebec.

Arctonetta fischeri (Brandt). Spectacled Eider.

Breeding range.—The spectacled eider has a more restricted range than any other of the family. It breeds north to Point Barrow, Alaska, and thence along the coast to the mouth of the Kuskokwim River. The range extends also along the northern coast of Siberia to the mouth of the Lena, but the species has not as yet been taken breeding on the Asiatic side. By far the greater number of individuals nest around Norton Sound.

Winter range.—Winter records are almost wanting; the species has been noted at this season on the Near Islands and Unalaska, and it is probable that the Aleutian chain constitutes the principal winter home.

Spring migration.—The breeding grounds are reached in May, the earliest record at Norton Sound being May 6, and the usual date a week or more later. The first have been noted at Point Barrow May 29, 1882, May 26, 1883, and May 31, 1898.

Fresh eggs have been found at St. Michael June 10, and newly hatched young July 23; downy young were secured at Point Barrow July 28, 1898.

Fall migration.—The latest records at Point Barrow are August 24, 1883, and September 17, 1897. During this latter month all the breeding grounds from Norton Sound northward are deserted.

Somateria mollissima borealis (C. L. Brehm). Northern Eider.

Breeding range.—This eider breeds in northeastern North America, south to Hamilton Inlet, Labrador, about latitude 54°; west to Southampton Island and Cape Fullerton, latitude 63°; north on the east coast of Greenland to Shannon Island, latitude 75°, and on the west coast to Dumb-bell Bay, latitude 82°; not abundant north of about 78° latitude. There is a lack of definite knowledge concerning the western limits of the range of this species. It is certain that the eiders of Hudson Bay, west to longitude 87°, belong to this form. It is also certain that the common eider on the Arctic coast of northwestern North America is *S. v-nigra*, and that this form occurs east along the coast of the mainland to about the mouth of the Coppermine River, 115° longitude. There seems to be no specimen of either form in any collection from the Arctic islands west of Baffin Bay. It is a fair presumption that the eiders of Wellington Channel and vicinity—longitude 90°-95°, where the species is common north to 77° latitude—belong to the eastern form and that those of Banks Land, longitude 115°-125°, are *S. v-nigra*, but the dividing line between the two forms remains to be determined. The typical form, *Somateria mollissima*, breeds in northwestern Europe and comes south in winter rarely to southern Europe.

Winter range.—In winter the northern eider ranges from southern Greenland and northern Hudson Bay south on the Atlantic coast to Massachusetts.

Spring migration.—Just north of the winter range, at Cumberland Sound, latitude 66°, the first appeared April 30, 1878; in Wellington Channel, latitude 76°, May 17, 1851; at Cape Sabine, latitude 79°, May 28, 1884; and at Thank God Harbor, latitude 81°, June 4, 1872.

The latest stragglers on the coast of New England leave the first week in April. The first eggs on Cumberland Sound were found June 21, 1878; the first at the south end of Greenland, June 24, 1886.

Fall migration.—The earliest migrants arrive on the coast of Massachusetts the last of October; the last were seen at Dumb-bell Bay, September 5, 1875; at Thank God Harbor, November 4, 1872; and in Cumberland Sound, November 17, 1878.

Somateria dresseri Sharpe. American Eider.

Breeding range.—The American eider rarely breeds on the coast of Maine; formerly its breeding range extended to the western side of Penobscot Bay, but is now restricted to a few colonies in Jericho Bay and on Old Man Island; it breeds abundantly on the shores of the Gulf of St. Lawrence and is fairly common north to the mouth of Hamilton Inlet, latitude 54°; it breeds commonly on the east shore of Hudson Bay, from latitude 54° to latitude 56°, and on the west shore in the vicinity of Fort Churchill.

Winter range.—The American eider winters as far north as Newfoundland; is common in the Gulf of St. Lawrence through the winter, and is not uncommon as far south as the Massachusetts coast; it is casual on the New Jersey coast, and is accidental near Marshall Hall, Md., and near Cobbs Island, Virginia (December 28, 1900). In the interior it has occurred on the Great Lakes; at Ottawa, Ontario; Licking Reservoir, Ohio; Lake Koshkonong, Wisconsin; and Loveland, Colo.

Spring migration.—After severe winters, when they have been driven away by the ice, American eiders return to Prince Edward Island about the last week in March and to Newfoundland the first of April. The last are seen on the Massachusetts coast in April (April 18, 1890; April 20, 1891; April 12, 1893; April 20, 1894; an unusually late bird was seen May 18, 1892). Eggs were found at Grand Manan, New Brunswick, May 31, 1833, and young on the south coast of Labrador July 4, 1860.

Fall migration.—They first appear off the Massachusetts coast early in November, occasionally in October (October 10, 1890; October 30, 1892), and are common by the end of November.

Somateria v-nigra Gray. Pacific Eider.

Breeding range.—The principal summer home of this eider is on the coasts and islands of Bering Sea and along the coast of the Arctic Ocean between the mouths of the Mackenzie and the Coppermine rivers. The species breeds west to the northeastern coast of Siberia and south to Cook Inlet, Kadiak Island, the Aleutians, Near, and Commander islands; it is accidental in the interior at Great Slave Lake and at Lawrence, Kans. It is probable that the eiders so abundant on Banks Land belong to this form and that a few range north to Melville Island.

Winter range.—The species seems to be massed during winter at the southern portion of the breeding range in the vicinity of the Aleutians.

Spring migration.—Early arrivals are sometimes seen near the mouth of the Yukon the last of April, but usually they appear about May 10. At Point Barrow the dates of arrival are May 16, 1882, and May 19, 1883. On the Kowak River eggs were found June 2, and the young appear about the first of July. Incubation seems to be simultaneous over all the district from the mouth of the Yukon to that of the Anderson.

Fall migration.—Pacific eiders seem to disappear from all points in their summer haunts at about the same time, the first week in October, but for several weeks previously numbers migrate along the north coast of Alaska. Many individuals winter and summer in the same locality, while the birds breeding about the mouth of the Coppermine River migrate at least 2,000 miles.

Somateria spectabilis (Linn.). King Eider.

Breeding range.—The king eider breeds in the arctic regions. It is abundant on the west coast of Greenland, breeding from latitude 66° north as far as land goes, to at least latitude 82° 30′; south to Nachvak, Labrador, latitude 59°; Southampton Island, Hudson Bay, latitude 63°; west along the Arctic coast to Icy Cape and Point Barrow, to St. Lawrence Island in Bering Sea, and on the whole coast of northern Siberia. It seems to be rather rare in northeastern Europe. It is abundant on the arctic islands north at least to Melville Island, latitude 76°, and to the same latitude in Wellington Channel.

Winter range.—This species winters as far north as open water can be found, at least to southern Greenland. It is common during the winter in the Gulf of St. Lawrence, whence a few stray each winter to Long Island Sound and the New Jersey coast; casual at Cape Charles, Va., January 2, 1897; Ossabaw Island, Georgia, December 1, 1904; St. Catherine Island, Georgia, December 3, 1904; Brunswick, Ga., April 25 and May 5, 1890.

The species has been noted occasionally in the interior on Lakes Cayuga, Oneida, Ontario, Erie, and Michigan. The Pacific birds winter abundantly in the Aleutians, south to the Shumagin and Kadiak islands; accidental near San Francisco, winter of 1879.

Spring migration.—Even as far north as Greenland migratory movements of the king eider are noticed in early February; the first arrival was noted at Igloolik, latitude 69°, April 16, 1823; Wellington Channel, latitude 76°, June 9, 1851; vicinity of Fort Conger, latitude 82°, June 12, 1872; June 16, 1882; June 11, 1883. The Pacific birds arrived at Point Barrow, latitude 71°, April 27, 1882, and May 5, 1883; eggs, Floeberg Beach, latitude 82° 30′, July 9, 1876. The last breeding birds desert southern Greenland late in April, though nonbreeders are not rare through the summer, and it is probably the presence of these that has given rise to reports that the species breeds in the Gulf of St. Lawrence; late birds have been recorded on the Massachusetts coast April 5, 1890; April 10, 1893; April 12, 1894; on Long Island April 21, 1887, and, as already noted, at Brunswick, Ga., May 5, 1890.

Fall migration.—This eider wanders south in late fall, the average date when it arrives on the coast of Massachusetts and Long Island being November 14 (earliest, October 21, 1899); it was noted on Lake Erie November 13, 1894, and at Calgary, Alberta, November 4, 1894. The height of the fall migration at Point Barrow is during September and October, and in 1882 the last one was seen there December 2, off St. Michael October 12, 1879, and at Fort Simpson, Mackenzie, October 25, 1903.

Oidemia americana Sw. & Rich. American Scoter.

Breeding range.—The lack of information in regard to the breeding of this species in northeastern North America is surprising. The species was described from the west shore of Hudson Bay, and occurs on the coasts of Labrador and the Gulf of St. Lawrence, but there seems to be no record of the discovery of the nest in this region. Nonbreeding birds are known to occur far south of the breeding grounds. The species is unknown from the whole vast interior of North America, between Hudson Bay on the east and the Yukon Valley on the west, and south almost to the United States boundary; it ranges north to Ungava Bay, Hudson Strait, and Fort Churchill, Hudson Bay, and apparently does not breed south of Newfoundland, nor in Labrador south of about latitude 52°; so that it follows by exclusion that the multitudes of these ducks that winter from the Gulf of St. Lawrence south along the Atlantic coast must breed in northern Ungava.

The American scoter is much more abundant on the Pacific coast, and breeds from the Aleutians and Near Island north to Kotzebue Sound and northeastern Asia.

Winter range.—The American scoter remains in winter around Newfoundland, except when it is driven away by the drift ice; thence south it is not uncommon to Long Island Sound and the coast of New Jersey, less common to South Carolina, rare or accidental in Florida; it is not rare on the Great Lakes during the winter, and has been observed at various places inland in the neighboring States; rare or accidental at St. Louis, Mo.; Lake Catherine, Louisiana; Lincoln, Nebr.; Fort Collins, Colo.; and Cheyenne, Wyo. The Pacific birds winter from the Aleutian Islands to the Santa Barbara Islands, California, and also to Japan on the Asiatic side.

Spring migration.—Arrivals from the south appear in the Gulf of St. Lawrence from March 25 to the first week in April, and the breeding grounds are reached soon after the middle of May. Most of the birds disappear from the coast of Massachusetts the last week of April, but belated individuals have been seen at Cobb Island, Virginia, May 19, 1891; Shelter Island, N. Y., June 5, 1893; and Woods Hole, Mass., June 10, 1891. On the Pacific side the first arrivals were noted at St. Michael, Alaska, May 16, and in Kotzebue Sound June 3. A few linger on the Pacific coast of the United States until early May.

Fall migration.—An American scoter was noted at Black River, Lewis County, N. Y., September 27, 1877; one at Ottawa, Ontario, September 21, 1887, and one at Woods Hole, Mass., September 9, 1891, but the regular flight does not occur until early October, and at about the same time the first migrants are seen on the coast of Puget Sound. The last ones leave St. Michael, Alaska, from the 10th to 15th of October.

Oidemia fusca (Linn.). Velvet Scoter.

This is an Asiatic and European species, an individual of which was taken in May, 1878, near Godthaab, on the western coast of Greenland.

Oidemia deglandi Bonap. White-winged Scoter.

Breeding range.—This scoter breeds along the north shore of the Gulf of St. Lawrence and north to Nachvak Bay, Labrador, about latitude 59°; in the interior it breeds in North Dakota (Devils Lake), Manitoba, Alberta, and north to Hudson Bay and the Arctic coast. On the Pacific coast it breeds from British Columbia (158-Mile House) north to Kotzebue Sound and the coast of northeastern Siberia, rarely to Point Barrow. It is not common anywhere in Alaska. Nonbreeders remain as far south in summer as the coast of California and are not uncommon along the New England coast south to Rhode Island.

Winter range.—The Gulf of St. Lawrence and south along the Atlantic coast to South Carolina—accidental in Florida—constitutes the winter range. The species is especially common on the coast of Massachusetts and Long Island Sound. In the interior it extends its range south regularly and commonly to the Great Lakes; less commonly to the smaller bodies of water in the neighboring States; casually to Louisiana, Illinois (opposite St. Louis), Iowa (Lost Island Lake), Nebraska (Omaha, Lincoln), Colorado (Fort Collins, Loveland, Longmont, Denver). It winters on the Pacific coast from Unalaska Island to San Quentin Bay, Lower California.

Spring migration.—Early northward movements on the New England coast begin late in March, and at about this time the first migrants appear in the Gulf of St. Lawrence; the principal flights occur from the middle of April to the first week in May. At Heron Lake, Minn., where the species does not winter, the first were noted April 6, 1888; March 21, 1889; April 5, 1890, and April 9, 1891; at Aweme, Manitoba, April 27, 1897; April 15, 1898, and April 22, 1899. In the Devils Lake region of North Dakota the earliest eggs are laid about the middle of June, and the first eggs were taken at Lake Manitoba in 1894 on June 26. These dates seem late, since eggs were taken near Fort Anderson, Mackenzie, June 22, 1865, and downy young were found near Fort Yukon, Alaska, June 23, 1866.

Fall migration.—Unusually early arrivals have been noted on the Massachusetts coast by August 10; the average date when the first of the regular flight appear is September 6, and the greater flocks pass October 10–20; the first were seen near Baltimore, Md., September 12, 1894, and the same latitude in the interior seems to be reached a month later, as attested by the following dates of arrival: Heron Lake, Minn., October 11, 1886; Lincoln, Nebr., October 14, 1899; Denver, Colo., October 16, 1890; Longmont, Colo., October 20, 1901; Loveland, Colo., October 11, 1903. On the coast of California migrants arrive the last of August.

Oidemia perspicillata (Linn.). Surf Scoter.

Breeding range.—This species breeds in northeastern Quebec (Point de Monts), southern Labrador, and Newfoundland, north as far as Hudson Strait; it is a summer visitor to the east coast of Greenland (Kangerajuk) and to the west coast as far north as Disco Bay, but is not known to breed; accidental in northern Europe; breeds abundantly at Fort Churchill, Hudson Bay, at Great Slave Lake, probably at Athabaska Lake, and north to the Arctic coast, west to the mouth of the Mackenzie. It is a common breeder on the headwaters of the Yukon, and from Sitka north to Kotzebue Sound. The species apparently is lacking on the north coast of Alaska, but nonbreeding birds are abundant on the coast of northeastern Siberia. Nonbreeders are found also all through the summer on the Atlantic coast south to Long Island and on the Pacific coast to Lower California.

Winter range.—The surf scoter remains around the Gulf of St. Lawrence until forced away by ice, and passes the winter from about the Bay of Fundy south to Florida. It is enormously abundant from Massachusetts to New Jersey, and still common to North Carolina; accidental in the Bermudas; it visits commonly the Great Lakes and extends south rarely to Louisiana (New Orleans, March 20, 1890), Illinois (opposite St. Louis, May 3, 1876), Kansas (Lawrence, October 29, 1887), Nebraska (Lincoln, October 7, 1896; Omaha), Colorado (Loveland, October 31, 1899; Denver, October 22, 1899), Wyoming (Douglas, October 19, 1893); on the Pacific coast from the Near Islands, and the Aleutians south to San Quentin Bay, Lower California.

Spring migration.—Birds from the south occasionally return to Nova Scotia late in March, more commonly the first week in April, and reach their breeding grounds about the first week in May. Those that migrate through the interior are nearly three weeks later. The Alaskan breeding grounds are reached about the middle of May. Eggs have been taken at Fort Anderson June 25 and downy young near Fort Yukon June 23.

Fall migration.—In 1900 stragglers appeared off the coasts of Maryland and Virginia the last week in August, about three weeks earlier than usual. The first fall migrants commonly arrive on the coast of Massachusetts and Long Island Sound the middle of September and are followed the second week in October by the main flight. The last leave the Gulf of St. Lawrence on the average November 7. Arrivals on the Great Lakes are rather later than in corresponding latitudes on the coast. A few surf scoters are seen on the California coast in July and August, though the main body hardly appears before November. They leave St. Michael, Alaska, and the upper Mackenzie about the middle of October.

Erismatura jamaicensis (Gmel.). Ruddy Duck.

Breeding range.—The principal summer home of the ruddy duck is in the upper Mississippi Valley and the contiguous portions of central Canada; it is rare east of the Alleghenies; breeds regularly from Maine to northern Ungava; rare visitant in Newfoundland; nesting rarely south to Massachusetts (Cape Cod) and probably in Rhode Island (Sakonnet); tolerably common in southern Ontario, Michigan, and Wisconsin, and probably breeds casually in Ohio and Illinois. West of the Mississippi it breeds regularly to southern Minnesota and northwestern Nebraska and rarely in Kansas. The breeding range then dips strongly to the south in the mountains through Colorado to northern New Mexico (La Jara and Stinking Spring lakes), central Arizona (Stoneman Lake, altitude 6,200 feet), southern California (Los Angeles County), northern Lower California to about latitude 31°, and probably northwestern Chihuahua (Pacheco). The breeding range on the Pacific slope extends north at least to central British Columbia (Cariboo District); in the interior to Great Slave Lake and Hudson Bay (York Factory). The above is the normal breeding range, but this species has the peculiar habit of establishing colonies far to the southward. Such colonies have been discovered at Santiago, near the southern end of Lower California, in the Valley of Mexico, at the Lake of Duenas, Guatemala, and on the islands of Cuba, Porto Rico, and Carriacou. The breeding season of these isolated colonies bears no relation to the usual breeding time in the bird's ordinary range. In northern North Dakota the earliest eggs are deposited the first week in June; in Manitoba and Saskatchewan incomplete sets were found the middle of June; the same date—the middle of June—marks the deposition of the eggs in central Colorado. The first half of June may be said to be the usual time for the beginning of nesting. On Cape Cod, Massachusetts, downy young were taken August 17; in northern New Mexico September 17; in southern Lower California, November 16; at Lake Duenas, Guatemala, in June; while in Cuba and Porto Rico eggs were taken in November, and on Carriacou Island in January.

Winter range.—In its choice of climate and environment the ruddy duck varies widely. While many individuals retire in winter to the southern part of the range, to southern Lower California, Tepic, Valley of Mexico, Oaxaca, and central Guatemala, others remain as far north as southern British Columbia. The northern limit in the Rocky Mountain region is Arizona and New Mexico; the species does not seem to remain through the winter in northern Texas, but at this season it is found in southern Illinois, Pennsylvania, the coast of Massachusetts, and even to Maine. During the winter the ruddy duck has been recorded in the Bermudas, the Bahamas (New Providence), Jamaica, Martinique, Grenada, Barbados, and once in Central America—outside of Guatemala—at Irazu, Costa Rica. From the Chesapeake Bay to Florida it is quite a common winter resident, though it is being rapidly diminished in numbers.

Spring migration.—The ruddy duck is rather a late migrant. Throughout its winter district, northward movements occur late in March, and just north of this region it appears early in April. Average dates of arrival are: Erie, Pa., April 16; Oberlin, Ohio, April 15 (earliest April 7, 1903); Heron Lake, Minn., April 10 (earliest April 3, 1889); eastern Nebraska, April 7; Cheyenne, Wyo., April 21; southern Manitoba, May 5 (earliest, April 26, 1891). The first migrant was seen at Osler, Saskatchewan, May 7, 1893, and at Fort Keogh, Mont., April 21, 1889.

Fall migration.—An excellent series of observations at Alexandria, Va., extending over sixteen years, fixes September 30 as the average date of arrival on the Potomac (earliest, August 20, 1889). The average date when the species becomes common is October 25. On the Massachusetts coast the ruddy duck is most common in October and November. Farther west in the same latitude migration is somewhat earlier, and the northern States, from Pennsylvania to Minnesota, are deserted the first half of November. The first date of arrival at Barbados is September 13, 1887.

Nomonyx dominicus (Linn.). Masked Duck.

This is a tropical species that lives principally in the West Indies and in eastern South America. It is common in Argentina to the Rio Negro and north through eastern and central Brazil to Guiana, Venezuela, and the islands of Trinidad, Barbados, St. Croix, Porto Rico, Haiti, Jamaica, and Cuba. This may be considered the regular range. In western South America the masked duck has been noted at Concepcion, Chile, both in June and September, 1894—this is directly west of its center of abundance in Argentina—at Tatarenda, in eastern Bolivia, and Lake Titacaca, in the western part; at Sarayacu and the river Peripa, in Ecuador; twice in Panama, once in Guatemala, and four times in Mexico (Orizaba, Jalapa, Matamoras, Escuinapa). Just across the river from Matamoras, at Brownsville, Tex., is the only place in the United States where it has been found that it seemed to be at home. As it was noted July 22, 1891, it probably breeds there. Strays have been found in Vermont (Alburg Springs, September 26, 1857), Wisconsin (near Newville, November, 1870), Massachusetts (Malden, August 27, 1889), and Maryland (Elkton, September 8, 1905).

The species is not strictly nonmigratory, but the data are insufficient to allow of exact statements concerning its migration.

DISTRIBUTION AND MIGRATION OF GEESE.

Chen hyperborea (Pall.). Lesser Snow Goose.

Breeding range.—Much remains to be learned of the boundaries of the summer home of the snow geese. "Vast numbers" of this goose were seen on the northwestern portion of Banks Land, latitude 74°, August 19, 1851, as though they had come from more northern breeding grounds, and in the spring of 1851 and 1852 flocks were seen passing north in the vicinity of the northern shores of this island; and yet no snow geese have been reported by any of the various expeditions that have summered on the islands immediately to the north of Banks Land. Snow geese are known to breed along the Arctic coast east of the Mackenzie River and to cross to Victoria Land, but here the record ends. Wollaston Land and Victoria Land form an enormous island whose interior has never been visited by white men. Many explorers have passed through the region to the northward, but no one has reported a snow goose in the whole district east of longitude 115° and north of latitude 70°, with the exception of a single flock seen near Bellot Strait in June, 1859, and three wanderers found in June, 1882, at Fort Conger, a thousand miles north of the regular range. Ross lived for three years at the base of the Boothia Peninsula without seeing a snow goose. Parry found but few birds and only one nest during his two years' sojourn on Melville Peninsula, and Kumlein reports them as rare visitants at Cumberland Sound. It follows, therefore, by exclusion, that the great bulk of the snow geese breed south of a line drawn from the north end of Southampton Island to the south end of Melville Island. It is supposed that the lesser snow goose is the form breeding at the mouth of the Mackenzie River, and east to about longitude 115°. It follows, therefore, that the greater snow goose is restricted in its breeding range to the district from Melville Peninsula to Victoria Land, an area perhaps half as large as Greenland, as yet scarcely visited by an ornithologist.

The most western breeding place of the lesser snow goose is Richards Island, on the eastern side of the mouth of the Mackenzie River; thence it ranges eastward to about Coronation Gulf. There seem to be two routes by which the snow geese reach their summer home. They are common in winter in California; indeed, this seems to be their principal winter abode. In the spring migration some continue up the coast to Alaska, but all observers agree that they are not common in Alaska during the spring migration. On the other hand, the species is an abundant migrant along the Mackenzie at Fort Simpson, just south of the breeding grounds, and the flocks in spring fly at a great height on their course toward the north. This is just the route the snow geese would take from California to their breeding grounds if they migrate by the most direct route. Though occurring accidentally in northern Europe and found on the Arctic coast of northeastern Asia, sometimes in considerable numbers, the lesser snow goose is not, as yet, known to breed in the Eastern Hemisphere.

Winter range.—Both forms of the snow goose occur during the winter season in the lower Mississippi Valley. It seems probable that in this district the Mississippi River is the approximate dividing line between the two forms, to the westward *C. hyperborea* being the more common, to the eastward, *C. nivalis*. Both forms winter as far north as southern Illinois, and the lesser snow goose is abundant in winter in Louisiana and Texas, and ranges south in Mexico to Guanajuato and Jalisco, and rarely to northern Lower California. It winters sparingly in southern Colorado, more commonly in Utah, abundantly in Nevada, and along the Pacific coast from southern California (Orange County) to southern British Columbia. On the Asiatic side it winters south to Japan.

Spring migration.—Writing many years ago, Ross states that the lesser snow goose arrives at Great Slave Lake earlier than the greater. Recent records of spring migration confirm this statement, and our present knowledge of isothermal lines affords a satisfactory explanation. It is considered that the common species in eastern North Dakota is *C. nivalis*, while the bird of Montana is *C. hyperborea*. Long-continued observations in the valley of the Red River of the North indicate that the first *C. nivalis* arrive on the average at latitude 47° on April 15; at the same latitude in central Montana the first migrants of *C. hyperborea* appear April 6. The more eastern birds advance to Aweme, Manitoba, latitude 50°, April 22, while at this latter date the van has reached Edmonton, Alberta, latitude 54°. Yet these more western and northern birds (lesser snow geese) are actually traveling in warmer weather than their eastern relations migrating at a later date; for during the last third of April the temperature at Edmonton averages about 2 degrees warmer than at Aweme.

Further advance of the lesser snow goose is recorded during the spring of 1904 to Fort Vermilion, latitude 58°, April 26, and to Fort Simpson, latitude 62°, May 2. East of Fort Simpson at Southampton Island, in Hudson Bay, this same spring the first snow geese were not seen until thirty-three days later—June 4—while to the westward, at Point Barrow, Alaska, more than 500 miles farther north, the first lesser snow geese arrive just about the same time as at Fort Simpson. The lesser snow geese that reach their breeding grounds by way of Alaska probably winter at least 800 miles farther north than those of the Mississippi Valley, and spring opens on the Pacific coast much earlier than in the interior.

The most northern records of the lesser snow goose are on Banks Land, where it arrived at Princess Royal Islands, latitude 73°, May 31, 1851, and at Mercy Bay, latitude 74°, May 31, 1852. The average rate of migration from central Montana, April 6, to Mercy Bay, May 31, is 33 miles per day.

During spring migration there is much difference in the length of time spent at different points of its route. In northern Texas the first appear March 4 and the last leave April 6, each being average dates; the extremes are February 18, 1887, and April 12, 1895; in other words, the snow goose is usually thirty-three days in passing northern Texas, and may linger fifty-four days. At the northern boundary of the United States, these periods are reduced about one-third, while still farther north near Lake Athabasca the species was present in 1901 for at least fourteen days, in 1903 for fifteen days, and at Fort Simpson in 1904 for twenty-three days. They arrive on the shore of Norton Sound, Alaska, from May 5 to 15, and at Nulato, on the Yukon, about May 9.

Fall migration.—Early migrants of the lesser snow goose were noted at Parry Bay, latitude 72°, August 13, 1821; at Point Barrow, latitude 70°, August 15, 1883; at Darnley Bay, latitude 69°, August 17, 1848; St. Michael, latitude 64°, September 2, 1878; Terry, Mont., latitude 47°, September 12, 1904; Stockton, Cal., latitude 38°, about September 29; central Texas, latitude 31°, about October 11. These dates indicate that the most northern breeders do not remain so long as ten weeks on the breeding grounds, and that they occupy fifty-eight days in retracing the path that required sixty-eight days during the spring migration.

The last seen on Banks Land were noted September 7, 1850; near Fort Norman, October 3, 1903; at mouth of the Yukon, about October 10; ten days later the last cross the boundary of the United States to the Mississippi watershed and desert central Nebraska about the first week in November.

Chen hyperborea nivalis (Forst.). Greater Snow Goose.

Breeding range.—The greater snow goose is enormously abundant on both the eastern and the western shores of Hudson Bay during spring migration, and these birds might be supposed to pass from these points approximately north to their breeding grounds. If such is the case it is somewhat strange that they have never been found breeding on any of the northern islands; nor have they been noted in migration anywhere north, northeast, or east of Hudson Bay, except the few seen at Igloolik, a few noted by Kumlein in Cumberland Bay, some stragglers that have wandered to the west coast of Greenland, and three birds seen by Greeley's party June 12–13, 1882, in Grinnell Land, latitude 82°. As already stated in connection with the lesser snow goose, it is probable that these Hudson Bay geese eventually turn to the northwestward and breed for the most part on Victoria Land.

Winter range.—During winter the greater snow goose has occurred in Cuba, Isle of Pines, Jamaica, and Porto Rico. Sometimes it has appeared in Cuba in quite large numbers. It is not usually common anywhere south of North Carolina. On this coast and as far as Chesapeake Bay it is not rare; a few are found in winter even as far north as Massachusetts. There is no sharply defined line in the Mississippi Valley between the winter ranges of the greater and the lesser forms. In general the greater snow goose is the more common east of the Mississippi River, and winters from southern Illinois to the Gulf.

Spring migration.—Throughout North America, north of Virginia and east of the immediate vicinity of Hudson Bay, the greater snow goose is a rare visitant; most of the spring dates in this region fall between March 20 and April 10. In the Mississippi Valley migration begins in February, and the first migrants appear north of the winter range early in March; the average date of arrival in central Iowa is March 22, and in northern Iowa March 26; southern Minnesota is reached April 6, southern Manitoba April 22, and in 1904 the first were noted in northern Hudson Bay June 4. The last leave the Gulf coast about the 1st of April; the average date for eleven years of the last seen at Aweme, Manitoba, is May 15, and the latest date May 20, 1903.

Fall migration.—One of the earliest dates of arrival of this species in New England is October 2, 1896, at Lake Umbagog; there are a few other October dates for New England. About the middle of October the earliest migrants appear on Chesapeake Bay, and the last of the month they arrive in Cuba and have been recorded in the Bermudas. In the fall the average date of arrival at Aweme, Manitoba, is September 28, and the earliest September 24, 1901; central Iowa is reached October 17, and the Gulf coast the last of the month. The average date of the last seen in the fall at Aweme, Manitoba, is October 20 (latest October 31, 1900).

Chen cærulescens (Linn.). Blue Goose.

Breeding range.—According to reports of Indians the blue goose nests in the interior of northern Ungava, but the nest and eggs are unknown to science, and there is no record of the presence of the birds anywhere in summer. During migration the species has been noted as an occasional visitant as far west as the western shore of Hudson Bay in the vicinity of Fort Churchill and east to New Hampshire.

Winter range.—The lower portion of the Mississippi Valley, principally west of the river, seems to be the winter home of this rather rare goose. It is not uncommon on the Gulf coast of Louisiana and Texas, and north to Nebraska and southern Illinois. It has occurred rarely or casually to the eastward in the Bahamas (Inagua), Cuba, Florida (Tortugas); North Carolina (near Fort Macon); Pennsylvania (near Pittsburg, 1887); New Jersey, New York (Shinnecock Bay, Long Island); Rhode Island (Newport, October 16, 1892); Massachusetts (Gloucester, October 20, 1876); New Hampshire (Lake Umbagog, October 2, 1896); Ohio (Oberlin, October 28, 1896; Columbus, October 28, 1876); Ontario (Ottawa, October 11, 1886; Gravenhurst, 1886). Apparently the only record west of the Rocky Mountains is that of two taken near Stockton, Cal., about February 1, 1892.

Spring migration.—Not many notes on the migration of this species are available. The few records indicate that the van moves across the central Mississippi Valley during the latter half of March and crosses to Manitoba the last of April or early May.

The blue goose seems to be exceptional in the selection of its migration route. The general trend of migration among waterfowl in North America is northwest and southeast. The blue goose apparently breeds entirely east of Hudson Bay and winters for the most part west of the Mississippi River, so that its spring migration flight is toward the northeast, across at least 20 degrees of longitude. At this season the large flocks pass north along the eastern side of James Bay, these flocks occasionally containing a few snow geese; while the enormous flocks of the latter that migrate north along the west side of James Bay are accompanied by a few blue geese.

Fall migration.—The above dates of occurrences outside of the normal range show that the fall migration is chiefly southward across the eastern United States and that it occurs in October.

Chen rossii (Cassin). Ross Snow Goose.

Breeding range.—The nest and eggs of this goose are still unknown, and there is no summer record of the species. The westernmost arctic locality known is Fort Anderson, and it ranges thence east to Hudson Bay. It is rare at each of these extremes, and the natural supposition is that the breeding grounds are to the north of the intervening district, that is, between the meridians of 100° and 120° west longitude. Observations on the birds of this region have been made by several observers, but they seem not to have distinguished this small white species from the larger snow goose.

Winter range.—The present known winter home of the Ross goose is California, where it occurs along the coast south to Orange County (Newport), and north to Stockton and the San Joaquin Valley. One was taken at Comox, British Columbia, January, 1894, but this occurrence was probably accidental. A pair was seen and one taken at Bustillos Lake, Chihuahua, also probably accidental.

Migration range.—The path of migration of this goose seems to be different from that of any other species. It is a fair presumption that the principal route coincides with the districts in which the species is most common. The greater number pass from the breeding grounds to Great Slave Lake and Lake Athabasca, continue south to central and western Montana, and then turn southwest, cross the Rocky Mountains, and pass to central and southern California.

Spring migration.—Records that are in close agreement indicate that the average date of arrival in spring at Great Falls, Mont., is April 7, and at Columbia Falls, Mont., April 8. The average date at which the last one was seen in central Montana is April 24. The birds were noted on the lower Athabasca River May 31, 1903, and one was taken May 25, 1865, at Fort Anderson, near the Arctic coast. The latest spring records are of its occurrence at Lake Athabasca, June 3, 1903, and at the base of Kent Peninsula, Arctic coast, June 2, 1902. The record of one taken near Camp Harney, Oreg., April 12, 1876, seems to be the only one for that State. A few have been taken in southern British Columbia at Shuswap Lake, Kuper Island, and the mouth of the Fraser River; one was taken at Fort Keogh, Mont., April 25, 1892.

Fall migration.—The returning flocks have been recorded at Great Slave Lake, September 1, 1893, at Columbia Falls, Mont., October 10, 1893, and at Newport, Cal., November 10, 1900. The average date of arrival at Columbia Falls, Mont., is October 15, and the latest date October 28, 1896. A straggler was taken at Winnipeg, Manitoba, September 20, 1902.

Anser albifrons (Gmel.). White-fronted Goose.

The typical species inhabits Europe and Asia, and is reported as having been taken in May and September at Angmagsalik and Tasinsak in eastern Greenland.

Anser albifrons gambeli (Hartl.). American White-fronted Goose.

Breeding range.—This goose breeds on the shore of the mainland from the mouth of the Yukon around the north side of Alaska and east to Lake Beechey on Back River; also coastwise for a few miles back in northern Mackenzie, and up the Yukon at least as far as Fort Yukon. The birds seen by Preble at Fort Wrigley, on the Mackenzie, July 23, 1904, may or may not have been breeding; a few nest on the coast of northeastern Asia in the vicinity of Bering Strait.

In giving the above range no mention is made of the birds that breed on the west coast of Greenland, where the species is not uncommon. It is evident from Labrador and Atlantic coast records that Greenland birds do not come to the southwest; hence they probably go to the southeast, and should be classed as European birds.

Winter range.—The white-fronted goose winters in the whole southern half of the United States and south to Cuba and northern Mexico.

Along the whole Atlantic slope it is rare; formerly, perhaps, it was not uncommon, but at present it is hardly more than an occasional winter visitant north to the coast of New Jersey, and an accidental migrant to New England, thence north to Labrador, where it has only once been recorded. It is not common in the interior east of the Mississippi River, and winters from the Gulf to southern Illinois and southern Ohio. The species is somewhat more common in migration along the eastern portion of the plains, wintering in southern Texas and more commonly in northern Mexico. The principal winter home is on the Pacific slope from Cape St. Lucas, Lower California, and Lake Chapala, Jalisco, to southern British Columbia. The few Asiatic birds winter on the coasts of China and Japan.

Spring migration.—The average date when the first migrants reach central Nebraska is March 9; Keokuk, Iowa, March 19; Aweme, Manitoba, April 18 (earliest April 6, 1905); Indian Head, Saskatchewan, April 22; Fort Vermillion, Alberta, April 27, 1904; Fort Resolution, Mackenzie, May 7, 1860; Fort Simpson, May 11, 1904; Fort Enterprise, May 17, 1821; Fort Anderson, May 16, 1864, May 17, 1865; Coronation Gulf, May 31, 1851.

On the Pacific slope migration is somewhat earlier; the first appear at St. Michael, Alaska, April 25 to May 10; at Nulato, May 6–10; Kowak River, May 10, 1899; Point Barrow, May 16, 1882, May 25, 1883. During the second half of April the last migrants leave the region south of Iowa and Nebraska; the average of the last seen at Aweme, Manitoba, for six years is May 11, and the latest May 17, 1898; the last leave California the first week in May. The first eggs were found near the mouth of the Yukon May 27, 1879; downy young were seen on the Kowak River June 24, 1899.

Fall migration.—Adults begin to leave the most northern breeding grounds by the middle of July, but so slow is the movement southward that on the average the first do not appear in southern Manitoba until September 26 (earliest September 7, 1902), and they reach the winter home, Louisiana to Texas, about the middle of October. At the same time the earliest of the fall migrants appear in central California, but the main flight does not arrive before November. The species has been noted at Stockton, Cal., as early as September 7. The last was noted at Point Barrow, Alaska, August 18, 1882; at the Kowak River, September 12, 1898; at St. Michael about October 7, and near Fort Wrigley, Mackenzie, October 9, 1903. The average date when the last are seen at Aweme, Manitoba, is October 13, and the latest was November 3, 1899.

Anser fabalis (Lath.). Bean Goose.

An Old World species of accidental occurrence (once) in northern Greenland.

Branta canadensis (Linn.). Canada Goose.

Breeding range.—The principal summer home of the Canada goose is the interior of Canada, from Saskatchewan and Alberta north to the limit of trees. Eastward it breeds commonly in the interior of Ungava and rarely on the coast as far north as Okak and Ungava Bay. It is not a rare breeder in Newfoundland, and is fairly common on the islands of the Gulf of St. Lawrence and thence west through Quebec and northern Ontario to the southern end of James Bay. Any occurrences south of this district must be considered accidental or casual, though it has been recorded as nesting at Lexington, Mass., April, 1888, and once at Hartland, Vt.

In the interior of North America the breeding range extends somewhat farther south. A hundred years ago the species bred commonly in all the northern third of the Mississippi Valley and not uncommonly to the latitude of St. Louis. Now the number of pairs breeding south of the latitude of central Iowa is very small, though even of late years the Canada goose has been known to breed at Samburg and at Reelfoot Lake, Tennessee, which seem to be the most southern localities known east of the Rocky Mountains. A few breed in Kentucky, and the number increases slightly in Indiana and Illinois and the southern third of Michigan and Wisconsin. North of this and throughout much of Minnesota the species is a regular and not uncommon summer resident. The Canada goose formerly bred in Kansas; now it breeds rarely in Nebraska and southern South Dakota; regularly in North Dakota and northward. The species still breeds in the northern third of Colorado, in northern Utah, northern Nevada, southern Oregon and northward. A half century ago it was recorded as breeding as far south as southern New Mexico. The western boundary of the breeding range extends from the interior of British Columbia to the upper Yukon and to Fort Yukon, with a few stragglers west to the Yukon mouth.

Winter range.—The principal winter home is the southern half of the Mississippi Valley west of the Mississippi River, but the species is not rare in the eastern United States from Florida to Maryland, occasionally to Massachusetts, and is recorded during the winter in Maine, Nova Scotia, Quebec, and even in Newfoundland. The normal winter range in the interior extends to southern Indiana and southern Illinois, but a few have been noted in winter in Ohio, southern Ontario, southern Michigan, southern Wisconsin, Nebraska, southern Colorado, and southern Utah. The winter home includes all of the Pacific coast region north to British Columbia, but in California typical *B. canadensis* inhabits the interior rather than the seashore. The Canada goose is an accidental visitant to the Bermudas and to the West Indies (Jamaica and probably St. Croix).

Spring migration.—More records on the movements of the Canada goose have been contributed than on any other three waterfowl combined. A synopsis of the most important of these notes is presented, both for the purpose of indicating the time of the principal migration movements and also of calling attention to the wide differences in the records from contiguous localities in the case of a locally distributed species like the goose.

Dates of arrival in spring of the Canada goose.

ATLANTIC COAST.

Place.	Number of years' record.	Average date of spring arrival.	Earliest date of spring arrival.
Central Maryland	6	Mar. 22	Feb. 15, 1892
Berwyn, Pa	5	Mar. 5	Feb. 18, 1901
Renovo, Pa	3	Mar. 15	Mar. 12, 1899
Hares Valley, Pa	5	Mar. 12	Feb. 19, 1887
Central Pennsylvania	19	Mar. 17	Feb. 13, 1892
Erie, Pa	4	Mar. 21	Mar. 2, 1902
Central New Jersey	16	Mar. 22	Feb. 4, 1890
Oak Orchard Light, New York	9	Mar. 18	Mar. 4, 1890
Montauk Point, Long Island	8	Feb. 24	Feb. 15, 1893
Shelter Island, Long Island	8	Mar. 14	Mar. 10, 1892
Central New York	20	Mar. 13	Jan. 31, 1890
Plattsburg, N. Y	....	Mar. 22	Mar. 17, 1886
Jewett City, Conn	11	Mar. 19	Mar. 2, 1902
Central Connecticut	17	Mar. 17	Feb. 1, 1890
Block Island Light, Rhode Island	11	Mar. 16	Feb. 21, 1898
Framingham, Mass	8	Mar. 26	Mar. 20, 1887
Central Massachusetts	19	Mar. 17	Feb. 25, 1888
St. Johnsbury, Vt	3	Mar. 21	Mar. 13, 1902
Northern Vermont	6	Mar. 23	Mar. 13, 1902
Southern New Hampshire	13	Mar. 21	Mar. 11, 1892
Southern Maine	15	Mar. 24	Mar. 5, 1902
Plymouth, Me	9	Apr. 1	Mar. 23, 1880
Quebec City, Canada	12	Mar. 27	Mar. 1, 1894
Montreal, Canada	6	Mar. 22	Feb. 15, 1893
Godbout, Quebec	3	Apr. 8	Apr. 5, 1887
Grand Manan, New Brunswick	5	Mar. 22	Mar. 1, 1890
Chatham, New Brunswick	6	Mar. 19	Mar. 1, 1902
Scotch Lake, New Brunswick	5	Mar. 20	Mar. 14, 1902
Pictou, Nova Scotia	9	Mar. 7	Feb. 26, 1889
Halifax, Nova Scotia	5	Mar. 13	Feb. 23, 1892
North River, Prince Edward Island	4	Mar. 20	Mar. 9, 1888
Alberton, Prince Edward Island	8	Mar. 19	Mar. 10, 1889
MISSISSIPPI VALLEY.			
Central Missouri	8	Feb. 11	(*a*)
Batavia, Ill	6	Feb. 22	Feb. 14, 1888
Chicago, Ill	18	Mar. 14	Jan. 15, 1897
Odin, Ill	5	Feb. 22	(*a*)
Lafayette, Ind	4	Mar. 2	Feb. 23, 1895
Bloomington, Ind	3	Mar. 5	Feb. 17, 1903
New Harmony, Ind	3	Feb. 8	Feb. 2, 1902
Frankfort, Ind	10	Feb. 19	Feb. 12, 1893
Waterloo, Ind	8	Mar. 14	Feb. 4, 1890
Sedan, Ind	6	Mar. 11	Feb. 13, 1891
Oberlin, Ohio	6	Mar. 9	Feb. 19, 1905
Wauseon, Ohio	4	Mar. 16	Feb. 23, 1888
Weymouth, Ohio	4	Mar. 13	Mar. 11, 1885
Petersburg, Mich	5	Mar. 5	Feb. 13, 1890
Battle Creek, Mich	5	Mar. 13	Mar. 8, 1903
Southern Michigan	19	Mar. 14	Feb. 23, 1890
Ottawa, Ontario	11	Apr. 4	Mar. 20, 1903
Southern Ontario	10	Mar. 16	Feb. 24, 1901
Southern Iowa	16	Mar. 1	Feb. 4, 1890
Storm Lake, Iowa	4	Feb. 17	Feb. 2, 1888
Spirit Lake, Iowa	7	Mar. 1	Feb. 23, 1886
Delavan, Wis	3	Mar. 4	Feb. 28, 1895
Southern Wisconsin	18	Mar. 13	Feb. 27, 1894
Heron Lake, Minn	4	Mar. 18	Feb. 23, 1886
Lanesboro, Minn	3	Mar. 21	Mar. 15, 1889
St. Paul, Minn	3	Mar. 22	Mar. 5, 1889
Elk River, Minn	4	Mar. 27	Mar. 11, 1885
Onaga, Kans	7	Feb. 14	(*a*)

[a] A few winter.

Dates of arrival in spring of the Canada goose—Continued.

MISSISSIPPI VALLEY—Continued.

Place.	Number of years' record.	Average date of spring arrival.	Earliest date of spring arrival.
Central Kansas	4	Feb. 13	(a)
Southern Nebraska	6	Feb. 21	(a)
Omaha, Nebr	4	Feb. 26	Feb. 12, 1898
Huron, S. Dak., and vicinity	6	Mar. 17	Mar. 2, 1889
Grand View, S. Dak., and vicinity	5	Feb. 23	Jan. 27, 1891
Argusville, N. Dak	6	Mar. 23	Mar. 8, 1892
Larimore, N. Dak	8	Mar. 21	Mar. 16, 1894
Aweme, Manitoba	11	Mar. 29	Mar. 9, 1905
Reaburn, Manitoba	9	Apr. 2	Mar. 25, 1900
Qu'Appelle, Saskatchewan	8	....do...	Mar. 25, 1905
Bulyea, Saskatchewan	....	....	Apr. 10, 1904
Indian Head, Saskatchewan	2	Apr. 1	Feb. 24, 1905
Fort Vermillion, Alberta	....	....	Apr. 15, 1904
Reindeer Lake, Saskatchewan	16	Apr. 30	Apr. 17, 1889
Fort Simpson, Mackenzie	14	Apr. 28	Apr. 22, 1904
Rathdrum, Idaho	2	Feb. 24	Feb. 3, 1901
Great Falls, Mont	3	Mar. 12	Mar. 10, 1889
Columbia Falls, Mont	5	Mar. 24	Mar. 17, 1895
Terry, Mont	10	Mar. 27	Feb. 28, 1892

[a] A few winter.

Dates of departure in spring of the Canada goose.

Place.	Number of years' record.	Average date of last one seen.	Latest date of last one seen.
Central West Virginia	3	Apr. 1	Apr. 21, 1886
Central Maryland	5	Apr. 4	Apr. 22, 1890
Berwyn, Pa	4	Apr. 11	Apr. 24, 1898
Renovo, Pa	3	Apr. 15	Apr. 16, 1900
Central Pennsylvania	10	Apr. 9	May 5, 1894
Central New Jersey	6	Apr. 16	May 9, 1887
Oak Orchard Light, New York	....	....	May 14, 1890
Montauk Point Light, Long Island	11	Apr. 22	Apr. 29, 1890
Southern Mississippi	4	Mar. 26	Apr. 20, 1903
Keokuk, Iowa	6	Apr. 3	Apr. 23, 1893
Grapevine, Tex	11	Apr. 4	Apr. 15, 1899
Northern Texas	7	Apr. 4	Apr. 9, 1885

Spring arrival of the Canada goose.

Year.	Central Missouri.	Frankfort, Ind.	Southern Iowa.	Chicago, Ill.	Southern Wisconsin.	Southern Michigan.
1884	Feb. 1	....	....	Mar. 15	Mar. 16	Mar. 15
1885	....	....	Mar. 2	Mar. 29	Mar. 28	Mar. 27
1886	Feb. 10	....	Feb. 23	Mar. 17	Mar. 16	Mar. 12
1887	....	....	Feb. 28	Mar. 12	Mar. 6	Mar. 8
1888	....	....	Mar. 1	Mar. 18	Mar. 15	Mar. 14
1889	Feb. 11	Feb. 15	Mar 2	Mar. 7	Mar. 15	Mar. 18
1890	....	....	Feb. 26	....	Mar. 19	Mar. 7
1891	....	....	....	Mar. 2	....	Mar. 10
1892	....	....	Feb. 26	....	Mar. 4	Mar. 5
1893	Feb. 4	Feb. 12	Feb. 26	Mar. 12	Mar. 10	Mar. 5
1894	....	Feb. 14	Mar. 1	Mar. 9	Mar. 3	Mar. 16
1895	....	Feb. 25	....	Mar. 13	Mar. 12	Mar. 25
1896	....	Feb. 21	Feb. 25	Mar. 6	Mar. 8	....
1897	....	Feb. 14	....	Mar. 16	Mar. 19	Mar. 8
1898	....	Feb. 17	Mar. 5	Mar. 10	Mar. 9	....
1899	....	Feb. 20	....	Mar. 21	....	....
1900	....	Feb. 21	Feb. 28	Mar. 13	....	Mar. 26
1901	....	Feb. 27	....	Mar. 16	....	Mar. 27
1902	Feb. 11	....	Feb. 28	Mar. 19	Mar. 9	Mar. 14
1903	Feb. 10	....	Mar. 1	Mar. 13	Mar. 17	Mar. 8
1904	Feb. 20	....	Feb. 29	....	Mar. 13	Mar. 8
1905	Feb. 22	....	Feb. 26	....	Mar. 18	Mar. 11
Average	Feb. 11	Feb. 19	Mar. 1	Mar. 14	Mar. 13	Mar. 14

Spring arrival of the Canada goose—Continued.

Year.	Southern Ontario.	Ottawa, Ontario.	Larimore, N. Dak.	Aweme, Manitoba.	Reaburn, Manitoba.	Terry, Mont.
1884	Mar. 18			Apr. 1		
1885	Mar. 25		Apr. 3			
1886			Mar. 22			
1887						
1888	Mar. 19					
1889	Mar. 12		Mar. 16			
1890	Mar. 12	Mar. 28	Mar. 24	Mar. 20		Mar. 27
1891						
1892						
1893		Apr. 8				Apr. 2
1894		Apr. 12	Mar. 16		Apr. 7	Mar. 18
1895	Mar. 26	Apr. 12	Mar. 22			
1896		Apr. 10		Mar. 26	Mar. 28	Mar. 27
1897	Mar. 12	Mar. 31		Apr. 7	Apr. 8	Apr. 4
1898	Mar. 14	Mar. 29		Apr. 7	Apr. 7	Apr. 3
1899		Apr. 8		Apr. 9	Apr. 10	
1900	Mar. 13	Apr. 5		Mar. 23	Mar. 25	Mar. 25
1901				Mar. 28	Apr. 2	
1902				Mar. 14	Mar. 27	
1903				Mar. 28	Mar. 27	Apr. 1
1904		Mar. 26	Mar. 24	Mar. 30		Mar. 22
1905	Mar. 19	Mar. 31	Mar. 24			Mar. 20
Average	Mar. 16	Apr. 4	Mar. 21	Mar. 29	Apr. 2	Mar. 27

The Canada goose is about the earliest water bird to migrate in spring, and throughout the whole course of its journey from its winter home to the Arctic coast it keeps close to the melting ice and the opening streams. The following dates seem a fair average for the time of arrival in the several districts:

Locality.	Latitude.	Date.
	° ′	
Southeastern Iowa	40 30	Feb. 20
Southern Minnesota	44 00	Mar. 19
Central Minnesota	46 00	Mar. 28
Southern Manitoba	50 00	Apr. 6
Alberta	58 00	Apr. 22
Southern Mackenzie	62 00	May 3
Northern Mackenzie	66 00	May 12

If the time occupied in passing from one district to the next is compared with the distance traveled, it will be found that the speed varies widely in different parts of the migration route. The following are approximate averages:

From latitude 40° to latitude 44°, 9 miles per day.
From latitude 44° to latitude 46°, 15 miles per day.
From latitude 46° to latitude 50°, 20 miles per day.
From latitude 50° to latitude 58°, 23 miles per day.
From latitude 58° to latitude 62°, 25 miles per day.
From latitude 62° to latitude 66°, 30 miles per day.

A great many records of the spring arrival of the Canada goose at the posts of the Hudson's Bay Company are available. Since this bird forms an important part of the food, both of the Indians and of the company's employees, a record is kept of its arrival each spring, and a reward is given to the person that secures the first one. These records show that the Canada goose is among the most variable of birds in the time of its arrival. This is natural, since its migration seems to depend almost wholly upon the presence of open water, and this varies much with the seasons. The record at Fort Simpson covers thirteen years between 1881 and 1894, and the average date of arrival is April 28, with extremes of fifteen days from April 23 to May 8. The average variation—the "probable error"—in time of arrival is 4.1 days, i. e., if the Canada goose is noted as arriving on a certain date in any one year at that latitude the probability is that this date is within 4.1 days of the average date of arrival at that locality. At Lac du Brochet Post, on Reindeer Lake, Saskatchewan, the following are the dates when the first Canada goose was seen:

1874	May 5	1880	May 5	1886	Apr. 23
1875	May 11	1881	May 4	1887	May 3
1876	May 8	1882	May 3	1888	May 7
1877	Apr. 27	1883	Apr. 25	1889	Apr. 17
1878	Apr. 19	1884	May 3		
1879	Apr. 24	1885	Apr. 29		

The average date of arrival is April 30, with extremes of twenty-four days from April 17 to May 11. The average variation is 5.9 days.

Eggs have been found in northern Indiana, southern Minnesota, and central Wyoming the first week in May, and sometimes even in April, and at Malheur Lake, Oregon, April 24. An early set was found May 4 near the Saskatchewan, and one May 11 near the Red Deer River, Alberta, but usually nesting in this district begins about the middle of May, and at the northern limit of the range not much before the middle of June.

Dates of arrival in the fall of the Canada goose.

Place.	Number of years' record.	Average date of first one seen.	Earliest date of first one seen.
Prince Edward Island	8	Aug. 28	Aug. 22, 1889
Scotch Lake, New Brunswick	3	Oct. 23	Oct. 21, 1902
Central Massachusetts	5	Oct. 11	Sept. 4, 1889
Block Island, Rhode Island	7	Oct. 21	Sept. 27, 1898
Montauk Point, Long Island	9	Oct. 20	Sept. 30, 1888
Renovo, Pa	4	Oct. 24	Oct. 7, 1904
Central Pennsylvania	8	Oct. 22	Oct. 15, 1894
Central New Jersey	14	Oct. 18	Sept. 23, 1897
Alexandria, Va	16	Oct. 20	Oct. 5, 1888
Atlantic, N. C	....	....	Oct. 20, 1899
Anderson, S. C	....	....	Oct. 10, 1902
Chipley, Fla	....	....	Oct. 8, 1902
Aweme, Manitoba	6	Aug. 14	Aug. 3, 1901
Central South Dakota	8	Sept. 23	Aug. 20, 1890
Northern Nebraska	7	Oct. 7	Sept. 7, 1888
Onaga, Kans	4	Oct. 18	Oct. 3, 1894
Grapevine, Tex	9	Oct. 9	Sept. 30, 1904
Central Wisconsin	8	Oct. 12	Sept. 30, 1892
Central Iowa	7	Oct. 14	Sept. 16, 1899
Keokuk, Iowa	8	Oct. 8	Sept. 27, 1895
Wauseon, Ohio	4	Oct. 20	Oct. 10, 1887
Central Indiana	5	Oct. 19	Oct. 6, 1902
Northern Illinois	4	Oct. 13	Sept. 28, 1895
Central Missouri	4	Oct. 4	Sept. 23, 1900
Helena, Ark	3	Oct. 4	Sept. 26, 1896
Southern Mississippi	2	Nov. 12	Nov. 5, 1902

Dates of departure in the fall of the Canada goose.

Place.	No. of years' record.	Average date of last one seen.	Latest date of last one seen.
Columbia Falls, Mont	4	Nov. 20	Nov. 24, 1895
Aweme, Manitoba	6	Nov. 17	Dec. 2, 1899
Southern Ontario	4	Nov. 7	Nov. 10, 1901
Southern Michigan	4	Nov. 8	Nov. 25, 1890
Central Minnesota	8	Nov. 9	Dec. 1, 1890
Central Iowa	13	Nov. 18	Dec. 26, 1904
Keokuk, Iowa	7	Nov. 10	Dec. 4, 1900
Central Nebraska	4	Nov. 27	(*a*)
Prince Edward Island	6	Dec. 1	Dec. 22, 1889
Grand Manan, New Brunswick	4	Nov. 15	Nov. 20, 1890
Montreal, Canada	4	Nov. 4	Nov. 14, 1896
Southern Massachusetts	8	Nov. 18	Dec. 28, 1877
Mantauk Point, Long Island	8	Nov. 21	Dec. 19, 1889
Renovo, Pa	6	Nov. 9	Nov. 18, 1903
Central Pennsylvania	7	Nov. 14	Dec. 6, 1899
Berwyn, Pa	6	Nov. 16	Dec. 15, 1891
Central New Jersey	9	Nov. 19	Dec. 10, 1902

[a] A few winter.

Branta canadensis hutchinsii (Rich.). Hutchins Goose.

Breeding range.—This is the most northern of the several forms of Canada goose and nests from Melville Peninsula north to latitude 70° and west along the shores and islands of the Arctic coast to the mouth of the Mackenzie and through the interior of Alaska to the Kowak River. Apparently it does not breed in the interior of North America south of the Barren Grounds, but on the Pacific coast it breeds in the valley of the Kowak River and south to the mouth of the Knik River; also abundantly in the western Aleutians and on the Near Islands. One was taken June 10 at Kingwah Fjord and a few have been taken at Disco and Godhaven, Greenland, but there seems to be no breeding record east of Hudson Bay.

Winter range.—The Hutchins goose seems to be more common in California during the winter season than elsewhere, though it is not rare in the rest of the southern United States west of the Mississippi River. Its normal eastern range is to Hudson Bay, Illinois, and Louisiana. It is known as a rare migrant in Maine and a century ago seems to have been not uncommon on the New England coast. A few pass through western New York, Ontario, and Ohio, and less rarely through Indiana. Southern Wisconsin seems to be the farthest north that it has been recorded in the interior during the winter season. It appears to be unknown on the Atlantic coast south of Virginia, but on the Pacific it passes south to San Rafael, Lower California, and probably to Lake Chapala, Jalisco, and winters north to southern British Columbia. One specimen is recorded from the city of Vera Cruz, Mexico, where it was accidental.

Spring migration.—Records are insufficient to allow of exact statements in regard to the movements of the Hutchins goose. In general it can be said that it migrates later than *B. canadensis.* The average date of its arrival in northern North Dakota and southern Manitoba is April 12, fully two weeks later than the Canada goose arrives. Hudson Bay is reached early in May and the extreme northern part of the range not much before the first of June. The first was noted near the mouth of the Yukon River May 8 and on the Kowak River May 14. Eggs were taken near Fort Anderson, Mackenzie, June 10, 1864, and June 14, 1865.

Fall migration.—Small family parties begin to flock early in August and flocks appear at Aweme, Manitoba, on the average September 21 (earliest September 13, 1904). First arrivals were noted at Terry, Mont., September 22, 1904; Delavan, Wis., October 12, 1894; central Kansas, October 5–13; central California about the first of October. The last noted at Cape McDonnel, Great Bear Lake, was on September 25; at Fort Wrigley, Mackenzie, October 12, and on the Kowak River, Alaska, September 14.

Branta canadensis occidentalis (Baird). White-Cheeked Goose.

This form is confined to the Pacific slope and breeds from the Klamath Lakes and Lake Tahoe, north to Sitka and Mitkof Island. It winters from Washington south to San Diego County, Cal. It appears south of its breeding range in early November and starts north so early in the spring that after the middle of March few are left in the southern part of the winter range.

Branta canadensis minima Ridgw. Cackling Goose.

This form is confined during the breeding season to Alaska, where it breeds abundantly along the coast from the Kowak River to the north side of the Alaska Peninsula. It breeds very abundantly also on the western Aleutians. It winters in southern British Columbia and thence south to San Diego County, Cal. It has been known to wander east to Hudson Bay, Wisconsin, and Colorado.

It is the earliest goose to reach the mouth of the Yukon in spring migration, arriving there from the 25th to the 30th of April, a few days after the last have deserted the southern portion of the winter range. The return movement begins late in August, is at its height by the middle of September, and the first arrive in central California about the first of October. The species deserts the Yukon region the last of September or early in October, and the Aleutians about the middle of November.

Branta bernicla (Linn.). Brant.

This is the Old World species that breeds north of the mainland of Europe and extends west to the east coast of Greenland; winters in northern Europe, rarely south to the Mediterranean.

Branta bernicla glaucogastra (Brehm). White-bellied Brant.

Breeding range.—There is a lack of knowledge as to the dividing line between this form and the black brant (*B. nigricans*). It is known that the latter breeds on the Arctic coast of America east about to longitude 125° (Franklin Bay), and that the species reaches its summer home by migration from the west and southwest, and not from the south by way of the Mackenzie Valley. It is known that the eastern brant occurs in migration on Melville Peninsula and passes along the east coast of Boothia Peninsula, longitude 92°. There seems to be no record of brant on the Arctic coast of the mainland between Franklin Bay and Boothia Peninsula—nearly a thousand miles—and yet brant of some form are common on all the islands that lie between these two longitudes north of 74° latitude. It is practically certain that the brant swarming in Wellington Channel, directly north of Boothia Peninsula, are the eastern form. Brant were seen on September 7, 1850, at the south end of Banks Land, and as they were then in full tide of fall migration they were undoubtedly on their way to the Arctic coast of the mainland and belonged to the western form. A year later, August 19, 1851, "vast numbers" were seen in the northwestern part of the same island as they were gathering for their migration. These also, then, were probably the western form, and they bred commonly along the northern shore of this island. Melville Island is only 50 miles from Banks Land, and hence it is probable that the "brent geese" taken by Parry on this latter island were the black brant. The dates of migration are of no help in settling this question. Brant arrived on Melville Island June 6, 1820, before June 9, 1853, and were seen on the north coast of Banks Land soon after June 1, 1852, or at about the same date they arrived in 1882–3, at Point Barrow, considerably farther south. They were noted in the vicinity of Wellington Channel, about latitude 75°, June 3, 1851, June 2, 1853, and about June 9, 1854. Almost directly south the first were not noted on Boothia Peninsula, latitude 70°, until June 12, 1830; June 20, 1831; and June 8, 1859; and still farther south on Melville Peninsula not until June 14, 1822, and June 14, 1823. While on the west coast of Greenland, at latitude 72°, the first were seen May 29, 1850, and at the extreme northern limit of the range, above latitude 82°, near the northwestern part of Greenland, they arrived June 9, 1876; June 3, 1882; June 5, 1883.

The eastern brant breeds on the west coast of Greenland from Frederikshaab, latitude 62°, northward probably as far as land extends, certainly as far north as the north shore of Grinnell Land, latitude 82° 33′. It probably breeds also on the islands north of latitude 74° and west to Wellington Channel. Breeding records south of this district are unsatisfactory, though the species will probably be found to breed rarely on North Somerset Island.

Winter range.—It is common during the winter along the Atlantic coast from Florida to New Jersey, less common on Long Island, and rare during the winter in Rhode Island and Massachusetts. A straggler was secured on Barbados, November 15, 1876.

Records for the interior of North America are not numerous. Specimens are recorded from the Whitewater Valley, Indiana; Ottawa, Ontario, fall of 1887; Racine, Wis.; Omaha, Nebr., November 9, 1895; Lake Manitoba, spring of 1889; Fort Lyon, Colo., April 11, 1883; Comox, British Columbia, January 10, 1904.

Spring migration.—Since no brant in spring pass north along the west coast of Hudson Bay, all the individuals of the species must perform their spring migration on the Atlantic coast. They return in February to Long Island Sound, where they stay in mild winters, and appear on the southeastern coast of Massachusetts on the average February 23. They are common in these waters for six weeks. By the end of March the van has already reached northern Nova Scotia. They spend the next month around the Gulf of St. Lawrence, and then move slowly northward. All observers agree that the brant do not go around the east shore of Newfoundland, but steer more directly north across the Labrador Peninsula. The average date on which they reach latitude 46° in the Gulf of St. Lawrence is March 23, and it is not until May 30 that early arrivals have been recorded in latitude 79°, showing an average speed of 34 miles per day. The average date of arrival in latitude 82° is June 7, or an average speed from latitude 41° to latitude 82° of 28 miles per day. The most northern record of the brant is latitude 82° 33′ on the north coast of Grinnell Land. Here it arrived June 9, 1876, and the first eggs were found June 21. A hundred miles to the south, at Ross Inlet, eggs were taken June 16, and at Cape Sabine, latitude 78° 40′, June 17, 1900.

The last disappear from North Carolina waters the first week in April; most leave Cape Cod, Massachusetts, by April 24, and the remainder about the 1st of May, though at various times birds have been seen the last week of this month. The south shore of the Gulf of St. Lawrence is deserted usually June 9–12, just as the earliest brant are arriving on their breeding grounds.

Fall migration.—Southward-moving flocks of brant were seen August 20, 1876, at Cape Lieber, latitude 81° 30′, ten weeks after the first had passed north. In less than three weeks the last had disappeared, i. e., they were not over three months on the breeding grounds. The black brant breeding at Point Barrow, Alaska, were present from June 5 to September 20, 1898, fifteen weeks, and this latter period is about as long as the interval spent at their breeding grounds by those small land birds of the Gulf States that migrate earliest in the fall.

Brant reappear in the Gulf of St. Lawrence late in September, and arrive at Long Island about the middle of October. They occupy less than sixty days in retracing their flight over the course to cover which in spring requires more than one hundred days. In the fall migration great numbers pass south along the west shore of Hudson Bay, but as the species is almost unknown in Manitoba and Ontario, these birds must pass through northern Quebec to gain the Atlantic coast.

Branta nigricans (Lawr.). Black Brant.

Breeding range.—The principal known breeding ground of this species is along the Arctic coast and islands in the vicinity of the mouth of the Anderson River. Thence westward a smaller number breed at Point Barrow. The species is common on the Siberian coast of the Chukchi Peninsula and west to the New Siberian Islands. As stated under the preceding species, it is probable that the brant breeding abundantly on Banks Land and in smaller numbers on Melville Island belong to this species.

Winter range.—The main body of the black brant winters on the coast of California, especially at Bodega Bay and Tomales Bay. A few pass as far south as San Quentin Bay and Cerros Island, Lower California, and the species is known in winter north to the Straits of Juan de Fuca. It penetrates inland to Pyramid and Washoe lakes, Nevada; Malheur and Klamath lakes, Oregon, and on the Atlantic coast has straggled to Chatham, Mass.; Oneida Lake, New York; Islip and Great South Bay, Long Island, and Long Beach, New Jersey. On the Asiatic side the brant goes south in winter to Japan.

Spring migration.—Brant begin to move northward in early March, but proceed so slowly that it is the middle of May when they arrive at the mouth of the Yukon, and the last of May when they reach Kotzebue Sound; the dates of arrival at Point Barrow are June 13, 1882, June 7, 1883, and June 5, 1898; downy young were taken there July 10, 1898. Most of the birds have left the California coast by the last of April, and it is a little strange that one of the latest records south of Alaska should come from Lower California, where several brant were seen May 9 and 10 in San Quentin Bay.

Instead of taking the long course around the northwest coast of Alaska, some brant that nest near the mouth of the Mackenzie make a short cut across the interior of Alaska, and the species is abundant for a few days each spring at Fort Yukon and La Pierre House on its way north and is seen each spring at Fort McPherson passing north along Peel River.

Fall migration.—Migrants return to the mouth of the Yukon from the middle to the latter part of September, appear in British Columbia a month later, and reach the California coast in November. The latest dates for Point Barrow are September 21, 1882, and September 20, 1898.

Branta leucopsis (Bechst.). Barnacle Goose.

This species inhabits the northern parts of the Old World, and in migration reaches Greenland, where it has been taken repeatedly on the eastern coast around Scoresby Sound, and a few times on the western side at Julianshaab and Fiskernœs.

The barnacle goose has been taken several times in the United States, and though some of these birds may have escaped from captivity, it is not probable that all are escapes. The species is recorded as taken at Currituck Sound, North Carolina, October 31, 1870; near Jamaica Bay, Long Island, about October 20, 1876; North Chatham, Mass., November 1, 1885; Marshfield, Vt.; Montreal, Canada; Okak, Labrador; Racine, Wis., December, 1850; and one at James Bay, near Rupert House.

Philacte canagica (Sevast.). Emperor Goose.

Breeding range.—This is an Arctic species, with a very restricted range in the vicinity of Bering Sea. It breeds along the Alaskan coast from the mouth of the Kuskokwim River north to Cape Espenberg and the southern shore of Kotzebue Sound. The principal breeding ground is near the mouth of the Yukon River, but a few pass west to St. Lawrence Island and to the Asiatic coast, and breed on the Chukchi Peninsula in the vicinity of East Cape.

Winter range.—The Aleutian chain is the main winter home of the species, outside of which a few are found west to the Near and the Commander Islands and east to Bristol Bay and Sitka. Stragglers wander south and have been taken twice on Vancouver Island and three times in California—Eureka, winter of 1884; Gridley, November 1, 1895; San Francisco market, October 8, 1900. Four were taken and a dozen or more noted, evidently members of a straggling flock, December 12, 1902, in the Hawaiian Islands.

Spring migration.—At the extreme southwestern part of the range the northward movement begins late in March. The latter part of April the emperor goose moves from the southern to the northern shores of the Aleutian Islands and remains there for several weeks. As soon as the melting snows expose mud flats on the coast of Norton Sound the birds make the ocean flight to their breeding grounds, where they arrive from May 15 to 25. Eggs have been taken June 5, and young birds late in June.

Fall migration.—The geese regain their feathers after the summer molt about the middle of August, and a few at once start south. The earliest date on the Aleutians is August 31. Most of the species remain at the breeding grounds until October and then are forced slowly south by the approach of winter, scarcely reaching the southwestern limit of the usual winter range before early December.

Dendrocygna autumnalis (Linn.). Black-bellied Tree-duck.

This tree duck comes into the United States in the lower Rio Grande Valley and breeds as far north as Corpus Christi; it arrives in April, the bulk leave in September and the last in November. It ranges throughout most of Middle America from western Mexico (Mazatlan) to Panama (River Truando); accidental in Jamaica. It winters in Mexico at least as far north as central Vera Cruz (Vega del Casadero) and Mazatlan. North of this district it is strictly migratory, and throughout most, if not all, of its range in Central America there seems to be a shifting of location between the winter and the summer homes, but no data are available to determine the movements with accuracy.

Dendrocygna fulva (Gmel.). Fulvous Tree-duck.

Resident in southern Louisiana (Lake Catharine, The Rigolets, New Orleans) and from Mexico north to central Texas (Galveston, North Concho River), southern Arizona (Fort Whipple), central California, and west central Nevada (Lake Washoe). In California the species has been found breeding north to Los Banos in the San Joaquin Valley, has been taken in winter in the Sacramento Valley (Marysville), and has been noted probably as a straggler in Marin County (Inverness). The breeding range in Mexico is from Lake Chapala, Lake Cuitzeo, and the Valley of Mexico northward, while in winter the species passes south to Guerrero and Chiapas. It has occurred in Lower California.

An unusual case of wandering occurred in the fall of 1905. A flock of ten was seen at Grays Harbor, Washington, on October 3, and one was secured. A straggler was taken at Swan Island, North Carolina, in July, 1886.

The migration habits of the fulvous tree-duck are peculiar; one of the most northern records (Marysville, Cal.) is of a winter specimen, and almost the most southern (Lake Cuitzeo, Mexico) is of breeding birds. While the species as a whole moves north to breed and south to winter—these movements occurring in April and October—a few remain throughout the year in most of the range.

The same species is found in South America, where it breeds commonly in the vicinity of Buenos Aires, and occurs thence north through Uruguay and Rio Grande do Sul, Brazil, to central Paraguay (Asuncion) and northern Argentina (Tucuman, Fortin Donovan). Accidentals have been noted in central Chile (Paine), northern Peru (Moyobamba), northwestern Ecuador (Vinces), and east central Brazil (Port Capuno, Rio Belmonte). Questionable records appear from Venezuela and the Island of Trinidad.

The migration habits of the fulvous tree-duck in South America are the same as in North America; a few are resident at either extreme of the range, while the bulk move south to central Argentina to breed, and retire to northern Argentina to spend the colder portion of the year. The greater part of the species is, therefore, confined to the immediate vicinity of the Rio de La Plata and the lower valleys of its larger branches in a district approximately 700 miles in length north and south, and scarcely half that in width. This same species is found also in southern Africa and southern Asia.

[**Dendrocygna viduata** (Linn.). White-faced Tree-duck.

This species does not come north to the United States, but has occurred as a straggler in Cuba (three records) and in Barbados (one flock). Its regular range is from Central Colombia and northeastern South America to Peru, Bolivia, and Paraguay; less common in Argentina, south to Buenos Aires. It seems to perform no regular migration in any part of its range.

The same species, or one so closely allied that it has not yet been separated, inhabits much of Africa from ocean to ocean, and from about 15° north latitude (Senegal) to 27° south latitude (Potchefstroom); also the island of Madagascar. Its range in Africa, therefore, is more extensive than in South America, and on the whole is in about the same latitude, for the range in South America extends from latitude 11° N. to latitude 34° S.]

[**Dendrocygna arborea** (Linn.). Whistling Duck.

This duck is known only from the West Indies, where it ranges from Andros Island, Bahamas, through all the Greater Antilles to St. Croix, Virgin Gorda, and Barbados of the Lesser Antilles; said to be a migrant, but the available data do not suffice to trace its movements.]

[**Dendrocygna discolor** (Scl. & Salv.). Southern Red-billed Tree-duck.

This duck ranges north to the island of Trinidad and to Davila, Panama. It is of wide distribution in northern South America from Colombia to Guiana and south to eastern Peru and northern Brazil. It appears to be resident throughout its range, unless possibly in the extreme northern part, Trinidad, and Panama.]

DISTRIBUTION AND MIGRATION OF SWANS.

Olor cygnus (Linn.). Whooping Swan.

This swan is common in Europe and Asia, and formerly was not rare in Greenland, where it is now nearly exterminated. Single specimens of late years have been taken at Atangmik, Godthaab, Ivigtut, and Arsuk in southern Greenland.

Olor columbianus (Ord). Whistling Swan.

Breeding range.—The whistling swan breeds principally north of the Arctic Circle, but a few nest on Southampton and Nottingham islands in Hudson Bay, and the species is reported as breeding at Kennedy Lake in Baffin Land. It is fairly common during the breeding season along the Arctic coast in the vicinity of the mouth of the Mackenzie, and not rare throughout much of Alaska. A few pass to the islands of the Arctic Sea, even to latitude 74°. One of the parties of the

Biological Survey found the whistling swan breeding at Becharof Lake in southern Alaska, latitude 58°, this being the most southern breeding record. Thence it breeds along the Yukon, about Kotzebue Sound, and probably to Point Barrow. Though found on the Asiatic side at Bering Island, as yet there is no record of its breeding in that country. Accidental once in Scotland and once in the Bermudas.

Winter range.—Probably about as common on Chesapeake Bay during the winter as in any part of its winter home; many pass to the coast of North Carolina and a few to Florida. It winters regularly north to New Jersey, and during the winter of 1877–78, one remained on Nantucket Island, Massachusetts, in which State the species was common when the first settlers arrived, but is now so rare that it seems to have been recorded only four times in the last thirty years. It never was common in the interior of North America, but a few occur locally in winter from southern Indiana and Illinois to the Gulf coast of Louisiana and Texas. It is more common along the Pacific coast, and winters regularly from southern British Columbia to southern California (Ventura County), and probably one was seen at San Rafael, Lower California. The species is recorded as wintering on Near Island, Alaska, far north of the usual winter home. One was seen January 18, 1904, near Colonia Diaz, Chihuahua, and some years earlier one was killed in the winter at Silao, Guanajuato.

Syring migration.—The northward movement begins in March, as shown by the following dates of arrival: Erie, Pa., March 11, 1897; Williamsport, Pa., March 20, 1905; Deerfield, N. Y., March 13, 1890; Lockport, N. Y., March 20, 1886; Detroit, Mich., March 14, 1905; Delavan, Wis., April 1, 1895, March 31, 1896; Heron Lake, Minn., April 6, 1886, March 31, 1894; Elk River, Minn., April 8, 1886; Fort Collins, Colo., March 16, 1895; Jordan River, Utah, March 10, 1850; St. Michael, Alaska, April 27, 1878; Kowak River, Alaska, May 11, 1899; Fort Simpson, Mackenzie, May 5, 1904; Fort Anderson, Mackenzie, May 18, 1865, and Melville Island, May 31, 1820. One seen near St. John, New Brunswick, April 8, 1882, seems to be the only spring record on the Atlantic coast north of Long Island for the last fifty years.

Since the species breeds to the westward of Hudson Bay and winters commonly on Chesapeake Bay and yet is practically unknown in spring in northeastern North America, it follows that its route in spring migration trends to the northwestward, and it is evident why at this season the species is not uncommon in the region of the Great Lakes and Manitoba.

Most whistling swans leave the United States from the middle to the latter part of April; unusually late birds were seen near Baltimore May 4, 1905, at Williamsport, Pa., May 30, 1901, while nonbreeders have spent the summer on Lake Malheur, Oregon.

Eggs were found at Nulato, Alaska, May 21, somewhat later at the mouth of the Yukon, and about the 1st of June in northern Alaska. The last egg of a set found on Winter Island, Melville Peninsula, was laid June 9, 1822.

Fall migration.—A fine set of records of the arrival of this species in the fall at Alexandria, Va., gives November 6 as the average date for sixteen years, and the birds became common by November 22; the earliest date was October 15, 1901. Near Baltimore, Md., an unusually early bird was seen September 26, 1893. The northern part of Alaska is deserted in early September, and the southern part a month later; few individuals arrive at their winter quarters on the Pacific coast before November.

Olor buccinator (Rich.). Trumpeter Swan.

Breeding range.—The principal summer home of this swan is in the interior of North America from the western shore of Hudson Bay to the Rocky Mountains, and from about latitude 60° to the Arctic Ocean. In early times it probably bred south to Indiana, Wisconsin, Iowa, Nebraska, Montana, and Idaho; it nested in Iowa as late as 1871; in Idaho in 1877; in Minnesota in 1886, and in North Dakota probably for a few years later. It is not probable that at the present time the trumpeter nests anywhere in the United States, and even in Alberta no nests seem to have been found later than 1891. The vast wilderness of but a generation ago is now crossed by railroads and thickly dotted with farms. The species is supposed still to breed in the interior of British Columbia at about latitude 53°. The eggs have been taken at Fort Yukon, and this is the westernmost record of the species.

Winter range.—As the summer home of the trumpeter swan is in the interior, so also is the winter home. The species is not rare south to Texas and remains as far north as it can find open water, sometimes as far as southern Illinois and southern Indiana. During its migrations it occasionally strays to the Atlantic slope (Lincoln, Del., November 9, 1886; Cayuga Lake; Buffalo). Throughout the western mountains of the United States south to Colorado, it is hardly to be considered more than a rare straggler, but on the Pacific coast it is not uncommon in winter from southern British Columbia to southern California (Los Angeles County).

Spring migration.—Early writers on the movements of this species in the northern interior of Canada agree in considering it one of the earliest migrants, arriving before the geese and next after the bald eagle, which is the first spring bird in that region. It is reported to have been seen at Fort Carlton, latitude 52°, March 30. There are no United States records that corroborate this view; the first arrive in southern Iowa, on the average, March 19; at Heron Lake, Minn., the average date of arrival is April 4, earliest March 21, 1889 (a very early spring); other average dates are: Nebraska, March 16; South Dakota, April 2; North Dakota, April 15; Saskatchewan, April 16; British Columbia about April 20. All these dates are later than those which mark the arrival in these districts of the early ducks and geese.

Fall migration.—The trumpeter begins to move south early in September, crosses into the United States the last of that month, and reaches the Gulf of Mexico in Texas about the middle of November. The last remain on the breeding grounds until October, when they are forced away by the gathering ice.

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Walter Mulfor
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Walter Mulford

CONNECTICUT SCHOOL DOCUMENT

No. 8 — 1901

(WHOLE NUMBER — 200)

Bird Day

1901

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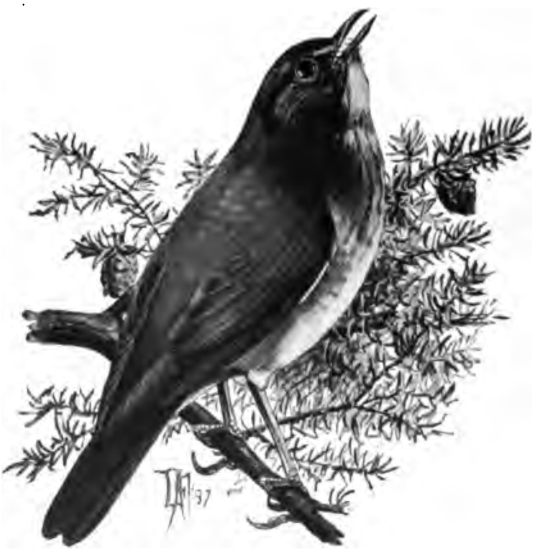

THE VEERY

BIRD DAY

"All animals have rights which man is bound to respect."
"A bird in the bush is worth two in the hand."

THE BIRDS AND THE HOURS

I

4 A. M.

Who is the bird of the early dawn?
The brown capped Chippy, who from the lawn
Raises his wings and with rapture thrills,
While his simple ditty he softly trills.

5 A. M.

Who is the bird of the risen sun?
The Robin's chorus is wellnigh done
When Bobolink swings from the clover high,
And scatters his love notes across the sky.

9 A. M.

Who is the bird of the calm forenoon?
The Catbird gay with his jeering tune,
Who scolds and mimics and waves his wings
And jerks his tail as he wildly sings.

NOON.

Who is the bird of the middle day?
The green-winged, red-eyed Vireo gray,
Who talks and preaches, yet keeps an eye
On every stranger who passes by.

5 P. M.

Who is the bird of the afternoon?
The Wood Thrush, shy, with his silvery tune
Of flute and zither and flageolet;
His rippling song you will never forget.

7 P. M.

Who is the bird of the coming night?
The tawny Veery, who, out of sight
In cool dim green o'er the waterway,
The lullaby echoes of sleeping day.

9 P. M.

Who is the bird that when all is still
Like a banshee calls? The Whip-poor-will;
Who greets the Nighthawk in upper air
Where they take their supper of insect fare.

MIDNIGHT.

Who are the birds that at midnight's stroke
Play hide-and-seek in the half dead oak?
And laugh and scream 'til the watch dog howls?
The wise-looking, mouse-hunting young Screech Owls.

ALL IN CHORUS

Good Night! Good Day!
Be kind to the birds and help repay
The songs they sing you the livelong day,
The bugs they gobble and put to flight —
Without birds, orchards would perish quite!
Good Day! Good Night!

(One child asks the question, "Who is the bird?" etc., and another answers with the remainder of the verse. Written for Bird Day Program by Mrs. M. O. Wright, Fairfield.)

II

THE LEGEND OF THE SALT

BY FRANK M. CHAPMAN

A great many years ago a little boy whom I knew very well accepted the advice of an elder, and went out with a salt-cellar to make friends with the birds. But they would not have him, even with a "grain of salt," and it was not until he was considerably older that he learned he had begun his study of birds at the wrong end. That is, you know, the wrong end of the bird, for it is not a bird's tail, but his bill, you must attend to if you would win his confidence and friendship.

So, instead of salt, use bread crumbs, seeds, and other food, and some day you may have an experience which will surprise those people who would think it a very good joke indeed to send you out with a salt-cellar after birds. I have recently had an experience of this kind. It happened in the heart of a great city, surely the last place in the world where one would expect to find any birds except House Sparrows. But Central Park, New York City, the place I refer to, contains several retired nooks where birds are often abundant. A place known as the " Ramble " is a particularly good one for birds, and during the past winter, when it was not too cold, I have often gone from my study in the nearby Museum of Natural History to eat my luncheon with the birds in the Ramble. Many other bird-lovers have also visited the park to study and feed the birds, and, as always happens when birds learn that they will not be harmed, they have become remarkably tame.

This is especially true of the Chickadees, who, under any circumstances, seem to have less fear of man than most birds. When I entered the Ramble they soon responded to an imitation of their plaintive call of two high, clearly whistled notes. And in a short time we became such good friends that I had only to hold out my hand with a nut in it to have one of them at once perch on a finger, look at me for a moment with an inquiring expression in his bright little eyes, then take the nut and fly off to a neighboring limb, where, holding it beneath his toes, he would hammer away at it with his bill, Blue Jay fashion. So, after this, we won't go out with salt-cellars, but with a supply of food; nor should we forget to take a "pocketful of patience," which, Mrs. Wright says, is the salt of the bird-catching legend. — *From Bird-Lore, by permission of The Macmillan Co.*

III

SUITABLE POEMS ABOUT BIRDS

The Birds of Killingworth	Longfellow
The Chickadee	Emerson
The Wood Pewee	Trowbridge
The Water Fowl	Bryant
The Humming Bird	Fawcett
The Oriole (in Under the Willows),	Lowell

IV

PLANT TREES

LINES WRITTEN FOR AN AGRICULTURAL EXHIBITION IN 1858 BY JOHN G. WHITTIER

This day, two hundred years ago,
The wild grape by the river's side,
And tasteless groundnut trailing low,
The table of the woods supplied.

Unknown the apple's red and gold,
The blushing tint of peach and pear;
The mirror of the Powow told
No tale of orchards ripe and rare.

Wild as the fruits he scorned to till,
These vales the idle Indian trod;
Nor knew the glad creative skill, —
The joy of him who toils with God.

O Painter of the fruits and flowers!
We thank thee for thy wise design
Whereby these humble hands of ours
In Nature's garden work with thine.

And thanks that from our daily need,
The joy of simple faith is born;
That he who smites the summer weed,
May trust thee for the autumn corn.

Give fools their gold and knaves their power;
Let fortune's bubbles rise and fall;
Who sows a field or trains a flower,
Or plants a tree, is more than all!

For he who blesses most is blest,
And God and man shall own his worth
Who toils to leave as his bequest,
An added beauty to the earth.

And soon or late to all that sow,
A time of harvest shall be given;
The flowers shall bloom, the fruit shall grow,
If not on earth, at last in heaven.

V

MATILDA ANN

I knew a charming little girl,
Who'd say, "Oh, see that flower!"
Whenever in the garden
Or woods she spent an hour.

THE SONG SPARROW

From *Citizen Bird*
By permission The Macmillan Co.

And sometimes she would listen,
  And say, "Oh, hear that bird!"
Whenever in the forest
  Its clear, sweet note was heard.

But then I knew another —
  Much wiser, don't you think?
Who never called a bird a "bird";
  But said "the Bobolink"
Or "Oriole" or "Robin"
  Or "Wren," as it might be;
She called them all by their first name,
  So intimate was she.

And in the woods or garden
  She never picked "a flower";
But "anemones," "hepaticas,"
  Or "pansies," by the hour.
Both little girls loved birds and flowers,
  But one love was the best:
I need not point the moral,
  I'm sure you see the rest.

For would it not be very queer,
  If when, perhaps, you came,
Your parents had not thought worth while
  To give you any name?
I think you would be quite upset,
  And feel your brain a-whirl,
If you were not "Matilda Ann,"
  But just "a little girl."

ALICE W. ROLLINS, in the *Independent*.

THE MYTH OF THE SONG-SPARROW

BY ERNEST SETON-THOMPSON

His mother was the Brook, his sisters were the Reeds,
And they every one applauded when he sang about his deeds.
His vest was white, his mantle brown, as clear as they could be,
And his songs were fairly bubbling o'er with melody and glee.
But an envious Neighbor splashed with mud our Brownie's coat and vest,
And then a final handful threw that stuck upon his breast.
The Brook-bird's mother did her best to wash the stains away,
But there they stuck, and, as it seems, are very like to stay.
And so he wears the splashes and the mud blotch as you see,
But his songs are bubbling over still with melody and glee.

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VI

JOHN JAMES AUDUBON

Children, do you all know what we are celebrating here to-day? We are doing honor to the trees and birds. We are trying to encourage you to plant trees and to care for them, and then to be interested in the little creatures that live in the trees. To understand them and so love them that not a bird in Connecticut shall ever be made nervous by the sight of a slingshot or by seeing the body of a dead relative on some little girl's hat.

The birds have not had many friends to protect them in the past. It is only lately that in some of the states large numbers of men, women, and children have formed themselves into companies, for bird study and protection, called " Audubon Societies."

Now, Audubon, for whom these societies are named, was one of the very first friends the birds ever had in this country. He loved them for their beauty and for their wild, shy ways from the time when he was a little boy.

John James Audubon was born in Louisiana about a hundred and twenty-five years ago, only a few years before we made our Declaration of Independence. It was an interesting time to be an American boy, and Audubon was always proud to remember that his father had been the friend of Lafayette and Washington. He was taken, when still a child, to France, his mother having met with a most tragic death during an insurrection of negroes in Santo Domingo. A most charming French woman soon became his father's second wife, but, unlike the usual fairy-story step-mother, she was almost too kind and too indulgent to our little John. While his father was away in America, on missions for France, all she asked of the little boy was to be happy, and happy he was in his own way. In the morning he was off for the woods with his lunch basket, filling it before his return with all sorts of curiosities in the way of flowers, lichens, and queer pebbles. His father had always loved those things himself, and had encouraged his boy when they had taken their walks together, in every little habit of observation. But he was not satisfied on his return, because the lessons had been neglected on account of these collections. For many years our young naturalist was kept away from home at school, where more attention was given to the study hour. Every leisure moment, however, was spent in the woods. Each creature there had its charm, and not a bird flitted past him but was watched and listened to till every habit and note was familiar. He was never satisfied till he had examined closely every one of them, but he soon found that to simply possess a dead bird was a very unsatisfactory and disappointing affair. It was then he made his first attempt to reproduce them on paper, making them as lifelike as possible. Fortunately he had always found drawing one of the most fascinating of his studies, and by the time he left France, at seventeen years of age, to make his home in America, he had more than two hundred drawings of birds.

His father gave him a farm near Philadelphia and I suppose expected him to make his fortune; and so he might have done if he had given half the time and attention to it that he did to his little feathered friends.

He married a lovely English girl who lived near him in Pennsylvania, and together they went to Kentucky to found a home and fortune in that new country. But always there was the same Audubon finding his best pleasures in the leafy stillness of the woods and gaining comfort for his many business disappointments in the songs of his little friends. He had known the woods about New York and Philadelphia very well, and now he wandered for months at a time through the Western wilds. We can imagine him, the figure we have become so familiar with from the pictures, with his sturdy frame, his large piercing eyes, and the long hair curling on his shoulders, resting for hours under the wide leafy dome and watching the flitting creatures about him.

Many a time he was without a dollar in his pocket with which to supply the needs of his wife and children, but he never lost interest in the wonderful set of drawings he was making of American birds, nor did his wife fail to sympathize with him and to help all she could by bearing cheerfully their many hardships. After his bird pictures were made, how was he to have them printed? It was finally arranged with great difficulty that he should go to England and try to have his work lithographed by persuading enough rich men to subscribe to it to pay the expenses. For ten years Audubon carried the drawings from place to place in England, Scotland, and France. A little story is told of his modesty and fright in approaching the house of Lizars, the skilled engraver. He hardly dared to open his portfolio, and with trembling hands he showed the first drawing. Mr. Lizars sprang from his seat, exclaiming: "Oh! I never saw anything like this before."

One hundred and forty-four subscribers were secured for the book, and it was the means of placing Audubon and his family in comfortable circumstances for the rest of his life. There are one hundred and seventy-five of these original copies known to be in existence, eighty of which are in America. The cost of printing them was over one hundred thousand dollars, and the copies that are rarely thrown on the market now bring from fifteen hundred to two thousand dollars.

You may be sure that after this success Audubon returned to his beloved America. He never became too old or too rich to lose his interest in the woods. He started a work on quadrupeds with Dr. Backman, following the same plan as the one on birds, and his son finished it after his death. The last house that he occupied and where he lived in comfort and with honor was a farm that is now a part of New York City. You may have heard of Audubon Park. That park is a part of the old Audubon farm. So, if any one asks you who Audubon was, and why American children should honor him, say: "He was the first man to devote his life to the study of the birds of our wonderful country, and the beautiful portraits he painted of them have made these feathered brothers known all over the world." And perhaps if there is a library in your town you, too, may be fortunate enough to see Audubon's "Birds of America."

DORA R. WHEELER.

VII

THE BIRD'S ORCHESTRA

Bobolink shall play the violin,
Great applause to win;
Lowly, sweet, and sad the Meadow Lark
Plays the oboe, Hark!
That inspired bugle with a soul —
'Tis the Oriole;
Yellow-bird the clarionet shall play,
Blithe, and clear, and gay.
Purple Finch what instrument will suit?
He can play the flute.
Fire-winged Black Birds sound the merry fife,
Soldiers without strife;
And the Robins wind the mellow horn,
Loudly eve and morn.
Who shall clash the cymbals? Jay and Crow;
That is all they know.
Hylas twang their harps so weird and high,
Such a tuneful cry!
And to roll the deep, melodious drum,
Lo! the Bull Frogs come!
Then the splendid chorus — who shall sing
Of so fine a thing?
Who the names of the performers call,
Truly one and all?
Blue-bird, Bunting, Cat-bird, Chickadee,
(Phœbe bird is he).
Swallow, Creeper, Crossbill, Cuckoo, Dove,
Wee Wren that I love;
Brisk Fly-catcher, Finches — what a crowd!
King-bird whistling loud:
Sweet rose-breasted Grossbeak Wren, Thrush,
Hear these two and hush;
Scarlet-tanager, Song-sparrow small,
(Dearer he than all;
At the first sound of his friendly voice,
Saddest hearts rejoice).
Redpoll, Nuthatch, Thrasher, Plover gray —
Curlew, did I say?
What a jangling all the grakles make!
Is it some mistake?
Anvil chorus, Yellow Hammers strike,
And the wicked Shrike
Harshly creaks like some half-open door;
He can do no more.

CELIA THAXTER.

VIII

HOW TO WATCH THE BIRDS*

When you see a strange bird, try to note quickly a few of the things most necessary to naming him. Then you must try to answer the following questions:

How many inches long was he?

What was his general color?

Was his breast plain or speckled?

What was he doing, feeding on the ground or in a tree?

Did he walk with one foot after the other, or hop with both feet together?

Did he sing or only call?

At first you will remember only two or three of these questions, and they will probably be his size, colors, and song, if he happens to be singing at the time.

You may not think that a bird who is hopping about on the grass, or flitting about the branches of a tree, is doing anything in particular. But really he may be either collecting material for his nest, or searching for some particular kind of food, in a way which will tell you to what bird brotherhood he belongs.

. . . .

The male is the only real singer in birdland. Many females have pretty musical notes that they give when about the nest, and some scraps of song; one or two are good musicians, but the great chorus comes from the males. Birds sing best from the time they put on their spring coat until after the nesting season, when they moult it off, so that the nesting season is the best time to name the birds, for then their clothes are freshest and their songs the most distinctive.

Everything in the daily life of a bird is interesting. You will find that every bird has its regular times for bathing, pluming its feathers, eating, sleeping, working, and playing, all in its own way, just as you yourselves have. And everything he does is done cheerfully and promptly.

---

* Adopted from "Citizen Bird." By Permission of the Macmillan Co.

IX

TO TEACHERS

Educate the Growing Generation

BY D. LANG, INSTRUCTOR IN NATURE STUDY IN THE PUBLIC SCHOOLS OF ST. PAUL, MINN.

This education must begin in our public schools. Every boy is a born bird student, but his natural methods are too destructive for the birds. In the nature study work children must learn the habits of our common birds and must learn of the benefits that the birds render us. Give them glimpses of the work of our birds, how they build their little homes, care for their young and defend them at the risk of their own lives. Show them to what dangers birds are constantly exposed and how the fall and spring migrations always are long, dangerous journeys.

Too much direct forbidding and preaching is harmful, for in the heart of every boy sleeps the spirit of opposition. Soft sentiment or gushing talking is also harmful. In connection with the study, read such articles as "Silverspot," "The Crow," and "Redruff, the Don Valley Partridge," in Thompson's "Wild Animals I Have Known." Literature of that kind creates true sympathy with nature, and after that is awakened the boy is converted.

Tell the children about the hardships that winter birds are exposed to, and teach them how to feed birds in winter and in unfavorable weather at other seasons. Let the boys make nesting boxes and study the tenants of the boxes. This bird study should not be mere play, but should be made profitable although pleasant work.

Let teachers do all they can to spread good bird literature and to fight such traditional ignorance that does, for instance, still prevail against Hawks and Owls. This work must, however, also receive due attention in high schools and normal schools from which our teachers go out. In these schools, as well as in common schools, bird study clubs can do much good, if they strictly refrain from collecting birds and eggs, and if the teachers see to it that nests are not too frequently visited. Every bird actually placed in a collection by school boys probably means the wounding or killing of half a dozen.

. . . .

Use good charts and colored pictures, observe the bird outdoors, and let alone those that you cannot reach by these means. . . . There is certainly knowledge that would be too dearly bought for the child. The flowers bloom most beautifully where they grow, and the birds are most beautiful and sing most sweetly when they perch on the free swaying branches. I know of more than one bird and egg collection that serves no other purposes except to be in safe cases and accumulate the dust of ages.

Bird Day in the Schools — Our teachers have so much experience in arranging all kinds of exercises that special directions for the observance of Bird Day seem unnecessary. Songs, declamations, reports of observations are in order. Reports about individual birds will always be much appreciated, and the younger the pupils are, the more anything with action in it will please them. Bird magazines and educational papers furnish an abundance of material, and much excellent matter can be found in the works of our classical poets and writers.

X

BIRDS' NESTS

> " The blue eggs in the Robin's nest
> Will soon have wings and back and breast,
> And flutter and fly away."
>
> — *Keramos.*

I wonder if children realize that a bird's nest is its home, and that the smooth, beautiful eggs, as the poem says, will soon be birds and fly away? That is, they would be birds if they were left safe in the nest home their parents build with such care.

Perhaps you say, " Who would think of stealing eggs? "

I can tell you who does this: the boys, big, medium-sized, and little ones who have only just put on trousers, all do it.

Of course, they all have reasons and excuses for this thieving, for it is theft.

Some "collect" eggs for the mere sake of seeing how many they can get, some are really interested in studying their varied forms and colors, and some merely rob nests from a spirit of mischief. Yes, I know all about it, for I have seen many boys sneaking about the trees and bushes, peeping into these bird homes, with no kind intentions toward the feathered owners.

Now, do you boys realize when you rob nests that you are not only very cruel, but that you are breaking the law of the State of Connecticut?

This law says: "Every person who shall kill, cage, or trap, or have in his possession, dead or alive, any Blue Bird, Baltimore Oriole, Purple Finch, Thrush of any kind, Cat Bird, Wren, Martin, Swallow, Chimney Swift, Bobolink, Robin, Nighthawk, Whip-poor-will, Fly-catcher, Warbler, Scarlet Tanager, Vireo, Nuthatch, Creeper, Humming Bird, Rose-breasted Grosbeak, Kinglet, Titmouse, Indigo Bird, Cedar Bird, Yellow Bird, Phœbe, Sparrow (except English Sparrows), or any species of the Woodpecker, Chickadee, or any other of the song or insectivorous birds, or who shall destroy the nests or eggs of any of said birds, shall be fined one dollar for each bird so killed, caged, trapped, or had in possession, or nest or egg destroyed."

The most that you should take, if you are really anxious to study eggs, is a single one from a nest, and only one. But even in this, do not be like four stupid boys I once knew, who went off hunting, each having promised to take but one egg from each nest. They kept their promise, but they each took one from the same nest!

The birds here in New England have three enemies that nature did not intend them to have: house cats, women and girls who will wear song-bird feathers in their bonnets, and boys who rob nests! A very learned man who has looked into this matter says that house cats work the greatest mischief to young birds, but that boys, by nest robbing, destroy as much bird life as the four-footed prowlers. Come, boys, is it possible that you have no more sense than hungry cats; or are you really cruel and hard-hearted? No, I do not believe that; you are probably simply thoughtless.

Turn over a new leaf, and stop a while to think.

If you know where there is a Cat Bird's or a Robin's nest, let the eggs stay, and watch them hatch. See how many bad insects and worms it takes to feed the brood, and you will soon see how useful birds are.

One word more, in a whisper: If you must collect eggs to see how many you can find, turn your attention to the English Sparrow. Get all the eggs of this mischievous bird that you can, and your country will thank you, for the English Sparrow is an enemy to the trees and an enemy to the useful insect-eating birds, and the wise men at Washington have found him guilty and condemned him to death! — *Selected.*

XI

"Then the little Hiawatha
Learned of every bird its language,
Learned their names and all their secrets,
How they built their nests in Summer,
Where they hid themselves in Winter.

. . . .

And the birds sang round him, o'er him,
'Do not shoot us, Hiawatha!'
Sang the Opechee, the Robin,
Sang the Bluebird, the Owaissa,
'Do not shoot us, Hiawatha!'"

— *Henry Wadsworth Longfellow.*

XII

THE BIRDS AND THE TREES

It was May Day. Half a dozen birds had collected in an old apple tree, which stood in a pasture close by the road that passed the schoolhouse; some of them had not met for many months, consequently a wave of conversation rippled through the branches.

"You were in a great hurry, the last time I saw you," said the little black and white Downy Woodpecker to the Brown Thrasher, who was pluming his long tail, exclaiming now and then because the feathers would not lie straight.

"Indeed! When? I do not remember. What was I doing?"

"It was the last of October; a cold storm was blowing up, and you were starting on your Southern trip in such a haste that you did not hear me call 'good-bye' from this same tree, where I was picking insect eggs that expected to hide safely in the bark all winter, only to hatch into all kinds of mischief in the spring. But I was too quick for them, my keen eyes spied them and my beak chiseled them out. Winter and summer, I'm always at work, yet some house people do not understand that I work for my living. They seem to think that a bird who does not sing is good for nothing but a target for them to shoot at."

"That is true," said the dust-colored Phœbe, dashing out to swallow a May Beetle, which stuck in her throat, causing her to choke and cough. "I can only call, yet I worked with the best for the farmer where I lodged last year. I made a nest on his cow shed rafters and laid two sets of lovely white eggs, but his boys stole them, and that was all my thanks for a season's toil."

"Singing birds do not fare much better," said the Thrasher. "I may say frankly that I have a fine voice and I can sing as many tunes as any wild bird, but children rob my nest, when they can find it, and house people drive me from their gardens, thinking I'm stealing berries."

"They treat me even worse," said the Robin, bolting a cut worm he had brought from a piece of plowed land. "In spring when I lead the Bird Chorus night and morning they rob my nest. In summer they drive me from the gardens where I work peacefully, and in autumn, when I linger through the gloomy days, long after your traveling brothers have disappeared, they shoot me for pot-pie!"

"It is a shame!" blustered Jennie Wren. "Not that I suffer much myself, for I'm not good to eat, and I'm a most ticklish mark to shoot at. Though I lose some eggs, I usually give a piece of my mind to any one who disturbs me, and immediately go and lay another nest full. Yet I say it is a shame the way we poor birds are treated, more like tramps than citizens, though we are citizens, every one of us who pays rent and works for the family."

"Hear, hear!" croaked the Cuckoo with the yellow bill. He is always hoarse, probably because he ate so many caterpillars that his throat is rough with their hairs. "Something ought to be done, but can Jennie Wren tell us what it shall be?"

"I've noticed that most of the boys and girls who rob our nests and whose parents drive us from their gardens go every day to that square house down the road yonder," said Mrs. Wren. "Now, if some bird with a fine voice that would make them listen could only fly in the window and sing a song telling them how useful even the songless bird brothers are, they might treat us better and tell their parents about us when they go home."

"Well spoken," said the Robin, "but who would venture into that house with all those boys? There is one boy in there who, last year, killed my mate with a stone in a bean-shooter, and also shot my cousin, a Blue Bird. Then the boy's sister cut off the wings of these dead brothers and wore them in her hat. I think it would be dangerous to go in that schoolhouse."

"The windows are open," said the Song-Sparrow, who had listened in silence. "I hear the children singing, so they must be happy. I will go down and speak to them, for, though I have no grand voice, they all know me, and perhaps they will understand my homely wayside song."

So the Sparrow flew down the road, but as he paused in the lilac hedge before going in the window, he heard that the voices were singing about birds, telling of their music, beauty, and good deeds. While he hesitated in great wonder at the sounds, the children trooped out, the girls carrying pots of geraniums which they began to plant in some beds by the walk. Then two boys brought a fine young maple tree to set in the place of an old tree that had died. A woman with a bright pleasant face came to the door to watch the children at their planting, saying to the boys: "This is Arbor Day, the day of planting trees, but pray remember that it is Bird Day also. You may dig a deep hole for your tree and water it well, but if you wish it to grow and flourish, beg the birds to help you. The old tree died because insects gnawed it, for you were rough and cruel, driving all the birds away from here about and robbing their nests."

"Please, ma'am," said a little girl, "our orchard was full of spinning caterpillars last season and we had no apples. Then father read in a book the government sent him that Cuckoos would eat the caterpillars all up, so he let the Cuckoos stay, and this year the trees are nice and clean and all set full of buds!"

. . . .

The Song-Sparrow did not wait to hear any more, but flew back to his companions with the news.

"I shall put my nest under the lilac hedge to show the children that I trust them," said he, after the birds had recovered from their surprise.

"I will lodge in the bushes near the old apple tree," said the Cuckoo; "it needs me sadly."

"I will build over the schoolhouse door," said the Phœbe; "there is a pea field nearby that will need me to keep the weevils away."

"I think I will take the nice little nook under the gable," said Jennie Wren, "though I need not build for two weeks yet, and I have not even chosen my mate."

"I shall go to the sill of that upper window where the blind is half closed," said the Robin. "They have planted early cauliflowers in the great field, and I must help the farmer catch the cutworms."

"I will stay by also," said the Woodpecker. "I know of a charming hole in an old telegraph pole, and I can see to the bark of all the trees that shade the schoolhouse."

Just then a gust of wind blew through the branches, reminding the birds that they must go to work, and May passed by, whispering with Heart of Nature, her companion, about the work that must be done before June should come; — June with her gown all embroidered with roses and a circle of young birds fluttering about her head for a crown.

"Dear Master," May said, "why am I always hurried and always working? I do more than all other months? July basks in the sun, and August sits with her hands folded while the people gather in her crops. Each year March quarrels with Winter and does no work; then April cries her eyes out over her task, leaving it dim and colorless. Even the willow wears only pale yellow wands until I touch them. The leaf buds only half unfold and the birds hold aloof from the undraped trees; see, nothing thrives without me." And May shook the branches of a cherry tree and it was powdered with white blossoms.

"Nothing grows by or for itself," said Heart of Nature, tenderly. "The tree is for bird and the bird for the tree, while both working together are for the house people if they will only understand me and use them wisely. Never complain of work, sweet daughter May. Be thankful that you have the quickening touch, for to work in my garden is to be happy."

Then the Song-Sparrow caught up the words and wove them in his song and carolled it in May's ear as she swept up the hillside to set the red-bells chiming for a holiday.

MABEL OSGOOD WRIGHT.

XIII

THE KITTIWAKES

Like white feathers blown about the rocks,
  Like soft snowflakes wavering in the air,
Wheel the Kittiwakes in scattered flocks,
  Crying, floating, fluttering, everywhere.

Shapes of snow and cloud, they soar and whirl;
  Downy breasts that shine like lilies white;
Delicate vaporous tints of gray and pearl
  Laid upon their arching wings so light.

THE KITTIWAKES

From *Wakeno*
By permission The Macmillan Co.

THE HUMMING BIRD

By permission The Macmillan Co.

Eyes of jet and beaks and feet of gold, —
  Lovelier creatures never sailed in air;
Innocent, inquisitive, and bold,
  Knowing not the dangers that they dare.

Stooping now above a beckoning hand,
  Following gleams of waving kerchiefs white.
What should they of evil understand,
  Though the gun awaits them full in sight?

Though their blood the quiet wave makes red,
  Though their broken plumes float far and wide,
Still they linger, hovering overhead,
  Still the gun deals death on every side.

Oh, begone, sweet birds, or higher soar!
  See you not your comrades low are laid?
But they only flit and call the more, —
  Ignorant, unconscious, undismayed.

Nay, then, boatman, spare them! Must they bear
  Pangs like those for human vanity?
That their lovely plumage we may wear
  Must these fair, pathetic creatures die?

Let the tawny squaws themselves admire,
  Decked with feathers, — we can wiser be.
I beseech you, boatman, do not fire!
  Stain no more with blood the tranquil sea.

CELIA THAXTER.

XIV

A HUMMING BIRD

When the mild gold stars flower out,
  As the summer gloaming goes,
A dim shape quivers about
  Some sweet, rich heart of a rose.

If you watch its fluttering poise,
  From palpitant wings will steal
A hum like the eerie noise
  Of an elfin spinning-wheel.

And then from the shape's vague sheen
  Quick lustres of blue will float,
That melt in luminous green
  Round a glimmer of ruby throat.

But fleetly across the gloom
  This tremulous shape will dart,
While searching for some fresh bloom
  To quiver about its heart.

Then you, by thoughts of it stirred,
  Will dreamly question them:
"Is it a gem, half bird,
  Or is it a bird, half gem?"

EDGAR FAWCETT.

CIRCULATING LIBRARIES

The Audubon Society of Connecticut has entrusted to the Connecticut Public Library committee fourteen libraries for circulation among the schools of the State. Application for these libraries should be made to Charles D. Hine, Chairman, New Britain, Conn. The titles of books in these libraries are given in the following list:

Library No. 1 (49)

Teachers' Library

Chapman	Bird-life
Marble	Nature pictures by American poets
Jackman	Nature study for grammar grades
Lange	Handbook of nature study
"	Our native birds
Wilson	Teachers' manual of nature study
Mathews	Familiar features of the roadside
"	Familiar trees and their leaves
Putnam	Among the moths and butterflies
Bailey	Lessons with plants

Library No. 2 (50)

The Garden-Craft Library

Bailey	Garden-making
"	The amateur's practical garden book
Rexford	Flowers: how to grow them
Weed	Insects and insectides
Bailey	The principles of fruit-growing
"	The pruning book
Mathews	Familiar flowers of field and garden
"	Familiar trees and their leaves
Merriam	Birds of village and field
Morley	The bee people

Library No. 3 (51)

The Children's Library

Miller	First book of birds
Stickney	The bird world
Dana-Parsons	Plants and their children
Keyser	News from the birds
Thompson	Selections from wild animals I have known
Dana-Parsons	How to know the wild flowers
Blanchan	Bird neighbors
Wright	Citizen bird
"	Four-footed Americans
Morley	The bee people

Library No. 4 (52)

The Ernest Seton-Thompson Library

Thompson	Wild animals I have known
"	The trail of the Sandhill stag
"	Wahb, the grizzly bear
Minot	The land birds of New England
Elliot	Game birds of North America
Lanier	Bob: the story of our mocking bird
Wright	Birdcraft
Keyser	In bird land
Dana-Parsons	How to know the wild flowers
Lange	Our native birds

Library No. 5 (53)

Frank M. Chapman Library

Chapman	Handbook of birds
"	Bird life
	Bird photography
Abbott	Birds about us
Stickney	The bird world
Merriam	Birds through an opera-glass
Blanchan	Birds that hunt and are hunted
Torrey	Birds in the bush
"	The footpath way
Dana-Parsons	How to know the wild flowers

Library No. 6 (54)

The Fairfield Library

Wright	The friendship of nature
"	Birdcraft
"	Tommy-Anne
"	Wabeno the magician
"	Citizen bird
"	Four-footed Americans
Dana	How to know the wild flowers
"	How to know the ferns
Mathews	Familiar trees and their leaves
Comstock	Insect book

Library No. 7 (55)

Olive Thorne Miller Library

Miller	First book of birds
"	Bird ways
"	In nesting time
"	Little brothers of the air
Lanier	Bob: the story of our mocking bird
Bailey	Lessons with plants
Parkhurst	The birds' calendar
Kearton	Wild life at home
Mathews	Familiar flowers of field and garden
Lange	Our native birds

Library No. 8 (56)

John Burroughs Library

Burroughs	Pepacton
"	Wake-robin
"	Birds and poets
"	Winter sunshine
"	Birds and bees, and sharp eyes
Merriam	Birds of village and field
Blanchan	Bird neighbors
Mathews	Familiar features of the roadside
Dana-Parsons	Plants and their children
Eddy	Friends and helpers

Library No. 9 (57)

Hamilton Gibson Library

Gibson	Sharp eyes
"	Eye spy
"	My studio neighbors
Thoreau	Walden
Chapman	Bird life
Morley	The bee people
Baskett	The story of the bird
Dana-Parsons	How to know the wild flowers
Ingersoll	Wild neighbors
Lange	Our native birds

Library No. 10 (58)

The Children's Library

Miller	First book of birds
Stickney	The bird world
Dana-Parsons	Plants and their children
Keyser	News from the birds
Thompson	Selections from wild animals I have known
Dana-Parsons	How to know the wild flowers
Blanchan	Bird neighbors
Wright	Citizen bird
"	Four-footed Americans
Morley	The bee people

Library No. 11 (71)

	Birds in natural colors, Vol. I, January to June, 1897
	Birds in natural colors, Vol. II, July to December, 1897
	Birds in natural colors, Vol. III, January to June, 1898
	Birds and all nature, in natural colors, Vol. IV, July to December, 1898
Burroughs	Squirrels and other fur bearers
Eckstorm	The woodpeckers
Fraser	Mooswa
Kearton	Our bird friends
Thompson	Wild animals I have known
Wright	Citizen bird
"	Four-footed Americans

Library No. 12 (72)

	Birds and all nature, in natural colors, Vol. V, January to May, 1899
	Birds and all nature, in natural colors, Vol. VI, June to December, 1899
	Birds and all nature, in natural colors, Vol. VII, January to May, 1900
	Birds and all nature, in natural colors, Vol. VIII, June to December, 1900
Burroughs . . .	Squirrels and other fur bearers
Eckstorm . . .	The woodpeckers
Fraser	Mooswa
Kearton . . .	Our bird friends
Thompson . . .	Wild animals I have known
Wright . . .	Citizen bird
“ . . .	Four-footed Americans

Library No. 13 (73)

	Birds in natural colors, Vol. I, January to June, 1897
	Birds in natural colors, Vol. II, July to December, 1897
	Birds in natural colors, Vol. III, January to June, 1898
	Birds and all nature, in natural colors, Vol. IV, July to December, 1898
Burroughs . . .	Squirrels and other fur bearers
Eckstorm . . .	The woodpeckers
Fraser	Mooswa
Kearton . . .	Our bird friends
Thompson . . .	Wild animals I have known
Wright . . .	Citizen bird
“ . . .	Four-footed Americans

Library No. 14 (74)

	Birds and all nature, in natural colors, Vol. V, January to May, 1899
	Birds and all nature, in natural colors, Vol. VI, June to December, 1899
	Birds and all nature, in natural colors, Vol. VII, January to May, 1900
	Birds and all nature, in natural colors, Vol. VIII, June to December, 1900

Burroughs . . .	**Squirrels and other fur bearers**
Eckstorm . . .	**The woodpeckers**
Fraser	**Mooswa**
Kearton . . .	**Our bird friends**
Thompson . . .	**Wild animals I have known**
Wright . . .	**Citizen bird**
" . . .	**Four-footed Americans**

STEREOPTICON LECTURES

The Audubon Society has also loaned to the Connecticut Public Library committee three sets of lantern slides.

A lecture will be sent with each set and will be useful in explaining the pictures.

A lantern is also furnished.

The sets, lectures, and apparatus will be loaned to all applicants under the following regulations:

1. The slides will be sent in the order of application.
2. All expense, including transportation, will be borne by the Connecticut Library committee.
3. In no case shall the use of the slides be permitted at any gathering where an admission fee is charged.
4. A report shall be made to the chairman of the Library committee on a blank to be supplied.

Application for the slides, lectures, and lantern should be made to Charles D. Hine, New Britain, Conn.

LIST OF STEREOPTICON SLIDES

i. *Facts About Birds that Concern the Farmer* — A lecture of particular interest to sportsmen and agriculturists, illustrated with nearly seventy lantern slides of Insect-eating Birds, Birds of Prey, Game Birds, and Water Fowls.

ii. *The Birds About Home* — A lecture suited to schools or mixed audiences, illustrated by seventy colored slides of the most interesting birds of garden, orchard, wood, or byway.

iii. *The Adventures of a Robin* — A short story-lecture for children under ten, illustrated by twenty-five colored slides.

BIRD CHARTS

Through the Connecticut Board of Education the Audubon Society offers sets of Bird Charts for the use of teachers under the conditions that control the traveling libraries. Each set consists of two charts, mounted for hanging, upon which the birds are figured in their natural size and colors, and two explanatory books.

PICTURES

Chart No. I

American Goldfinch
American Robin
Baltimore Oriole
Barn Swallow
Black and White Warbler
Blue Bird
Blue Jay
Bobolink
Catbird
Cedar Bird
Chickadee
Chimney Swift
Chipping Sparrow
Downy Woodpecker
Flicker
Golden-Crowned Kinglet
House Wren
Kingbird
Purple Finch
Red-eyed Vireo
Ruby-throated Hummingbird
Red-winged Blackbird
Scarlet Tanager
Song Sparrow
Wood Thrush
Yellow Warbler
Total, 26

Chart No. II

Cardinal
Chestnut-sided Warbler
Chewink
Cowbird
Bay-winged Bunting
Black-throated Green Warbler
Brown Thrasher
Yellow-billed Cuckoo
Red-Headed Woodpecker
Whippoorwill
Phœbe
Wood Pewee
Least Fly-Catcher
Bronzed Grackle
Rose-breasted Grosbeak
Indigo Bunting
Tree Swallow
Warbling Vireo
Yellow Throated Vireo
Pine Warbler
Oven-bird
Yellow Throat
Redstart
White-Bellied Nuthatch
Veery or Wilson's Thrush
Total, 26

Issued April 11, 1910.

Walter Mulford

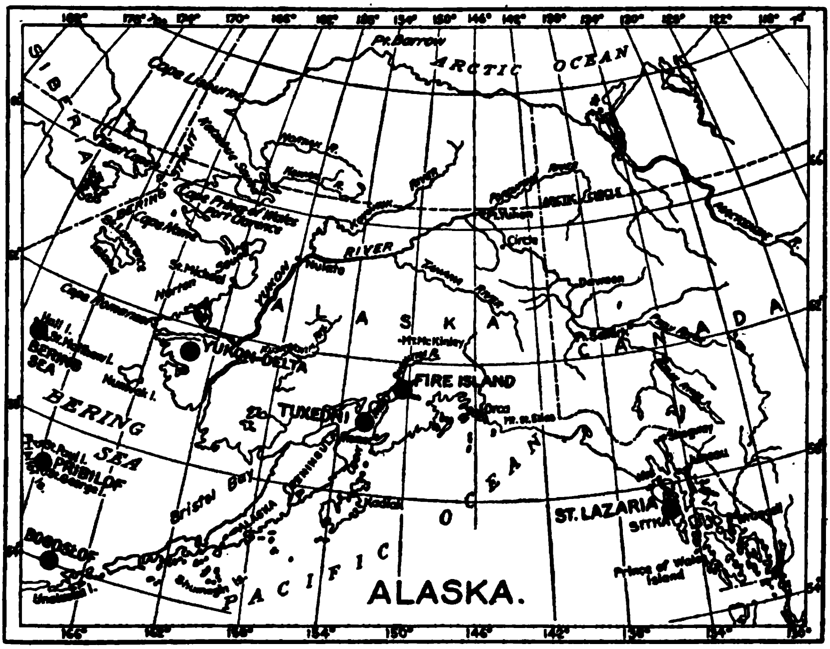
United States Department of Agriculture,

BUREAU OF BIOLOGICAL SURVEY—Circular No. 71.

C. HART MERRIAM, Chief of Bureau.

NATIONAL BIRD AND MAMMAL RESERVATIONS IN ALASKA IN CHARGE OF THE U. S. DEPARTMENT OF AGRICULTURE.

Seven reservations for the protection of birds and mammals in Alaska have been set aside by executive order and placed in charge of the Department of Agriculture. These reservations, created in February and March, 1909, comprise, with one exception, small islands at several points along the coast of Alaska and in Bering Sea, as follows:



Map showing location of reservations.

Bering Sea Reservation	Saint Matthew, Hall, and Pinnacle islands.
Fire Island Reservation	Near head of Cook Inlet.
Tuxedni Reservation	Chisick and Egg islands, Cook Inlet.
Saint Lazaria Reservation	Saint Lazaria Island, Sitka Sound.
Yukon Delta Reservation	Tundra of the Yukon Delta.
Pribilof Reservation	Walrus and Otter islands, Bering Sea.
Bogoslof Reservation	Bogoslof Islands, Aleutian Archipelago.

Fire Island is the breeding ground of the Alaska moose, the islands in Bering Sea contain rookeries of sea lions, and all of the reservations are important breeding grounds of sea birds or ducks and geese.

All of these species are protected by the Alaska game law (35 Stat., 102), and the birds on the reservations are protected by the following act of Congress:

LAW PROTECTING BIRDS AND THEIR EGGS ON BIRD RESERVATIONS.

[Criminal Code, sec. 84, 35 Stat., 1104.]

Whoever shall hunt, trap, capture, willfully disturb, or kill any bird of any kind whatever, or take the eggs of any such bird, on any lands of the United States which have been set apart or reserved as breeding grounds for birds, by any law, proclamation, or executive order, except under such rules and regulations as the Secretary of Agriculture may, from time to time, prescribe, shall be fined not more than five hundred dollars, or imprisoned not more than six months, or both.

EXECUTIVE ORDER.

It is hereby ordered that Saint Matthew island, Hall island, and Pinnacle islet, situated in Bering Sea, approximately in latitude sixty degrees, thirty minutes north, longitude one hundred and seventy-two degrees, thirty minutes west from Greenwich, as segregated by the broken line shown upon the diagram hereto attached and made a part of this order, be and the same are hereby reserved and set apart for the use of the Department of Agriculture as a preserve and breeding ground for native birds. It is unlawful for any person to hunt, trap, capture, wilfully disturb, or kill any bird of any kind whatever, or take the eggs of such birds within the limits of this reservation, except under such rules and regulations as may be prescribed by the Secretary of Agriculture. Warning is expressly given to all persons not to commit any of the acts herein enumerated and which are prohibited by law. This bird refuge to be known as Bering Sea Reservation.

THEODORE ROOSEVELT.

THE WHITE HOUSE, *February 27, 1909.*

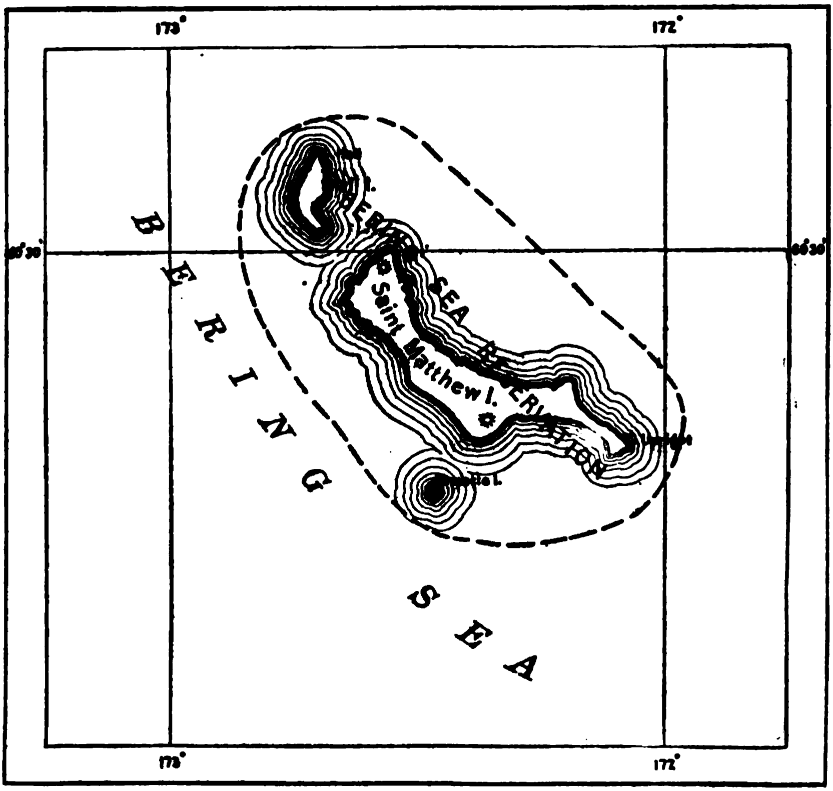
[No. 1037.]

BERING SEA RESERVATION

For Protection of Native Birds

ALASKA

Embracing Saint Matthew and other Islands
segregated by broken line and designated
"Bering Sea Reservation"



DEPARTMENT OF THE INTERIOR
GENERAL LAND OFFICE
Fred Dennett, Commissioner

[Cir. 71]

EXECUTIVE ORDER.

It is hereby ordered that Fire Island, located approximately in latitude sixty-one degrees, fifteen minutes North, longitude one hundred and fifty degrees, fifteen minutes West from Greenwich, and near the head of Cook Inlet, south coast of Alaska, be and the same is hereby reserved and set apart for the use of the Department of Agriculture as a preserve and breeding ground for the Alaska moose.

THEODORE ROOSEVELT.

THE WHITE HOUSE, *February 27, 1909*.

[No. 1038.]

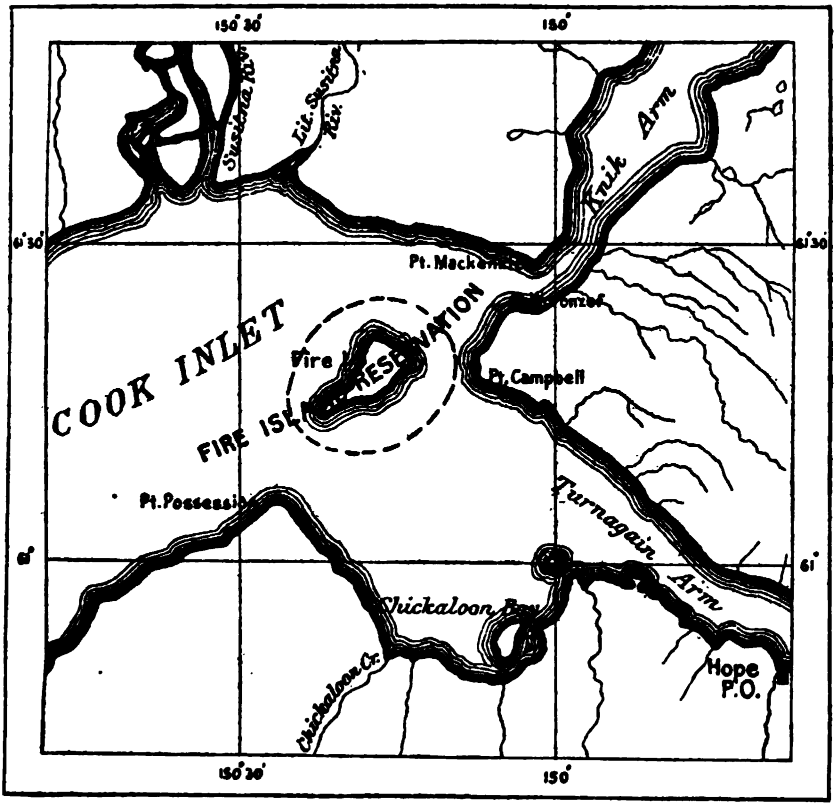
[Cir. 71]

FIRE ISLAND RESERVATION

For Protection of Alaskan Moose

ALASKA

Embracing Fire Island situated near head of Cooks Inlet as segregated by broken line and designated "Fire Island Reservation"



DEPARTMENT OF THE INTERIOR
GENERAL LAND OFFICE
Fred Dennett, Commissioner

[Cir. 71]

EXECUTIVE ORDER.

It is hereby ordered that Chisick Island and Egg Island, situated approximately in latitude sixty degrees, fifteen minutes north, longitude one hundred and fifty-two degrees, thirty minutes west from Greenwich, at the entrance to Tuxedni Harbor, Cook Inlet, Alaska, as segregated by the broken line shown upon the diagram hereto attached and made a part of this order, be and the same are hereby reserved and set apart for the use of the Department of Agriculture as a preserve and breeding ground for native birds. It is unlawful for any person to hunt, trap, capture, wilfully disturb, or kill any bird of any kind whatever, or take the eggs of such birds within the limits of this reservation, except under such rules and regulations as may be prescribed by the Secretary of Agriculture. Warning is expressly given to all persons not to commit any of the acts herein enumerated and which are prohibited by law. This bird refuge to be known as Tuxedni Reservation.

THEODORE ROOSEVELT.

THE WHITE HOUSE, *February 27, 1909.*

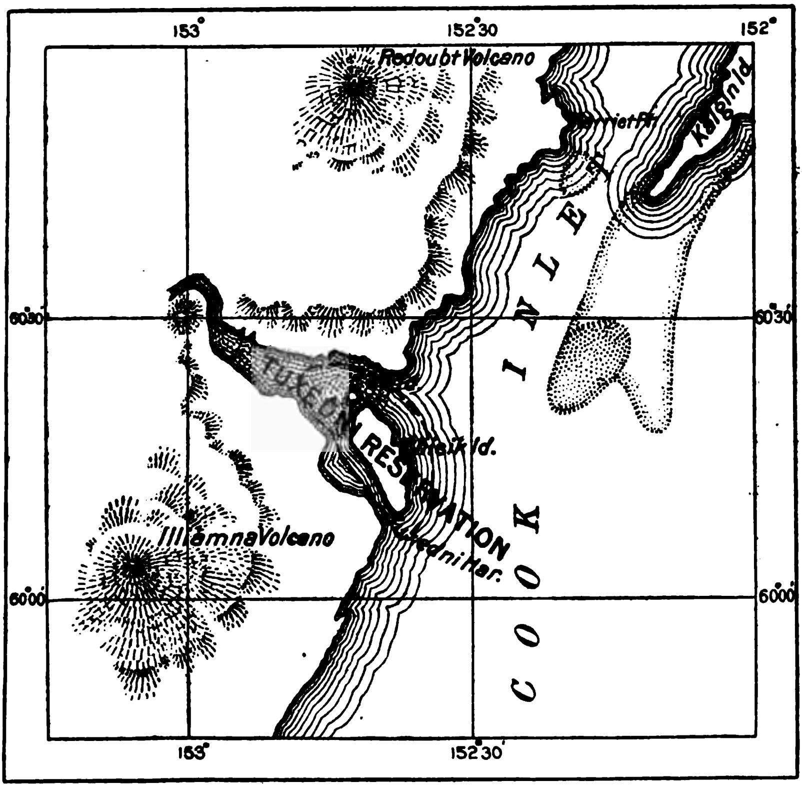
[No. 1039.]

TUXEDNI RESERVATION

For Protection of Native Birds

ALASKA

Embracing Chisik, Egg and other small islands in and at the mouth of Tuxedni Harbor in Cooks Inlet, Alaska, as segregated by the broken line and designated "Tuxedni Reservation"



DEPARTMENT OF THE INTERIOR
GENERAL LAND OFFICE
Fred Dennett, Commissioner

[Cir. 71]

EXECUTIVE ORDER.

It is hereby ordered that the island of Saint Lazaria, situated at the entrance to Sitka Sound, Alaska, approximately in latitude fifty-six degrees, fifty-nine minutes north, longitude one hundred and thirty-five degrees, forty-two minutes west from Greenwich, as segregated by the broken line shown upon the diagram hereto attached and made a part of this order, be and the same is hereby reserved and set apart for the use of the Department of Agriculture as a preserve and breeding ground for native birds. It is unlawful for any person to hunt, trap, capture, wilfully disturb, or kill any bird of any kind whatever, or take the eggs of such birds within the limits of this reservation, except under such rules and regulations as may be prescribed by the Secretary of Agriculture. Warning is expressly given to all persons not to commit any of the acts herein enumerated and which are prohibited by law. This bird refuge to be known as Saint Lazaria Reservation.

THEODORE ROOSEVELT.

THE WHITE HOUSE, *February 27, 1909.*

[No. 1040.]

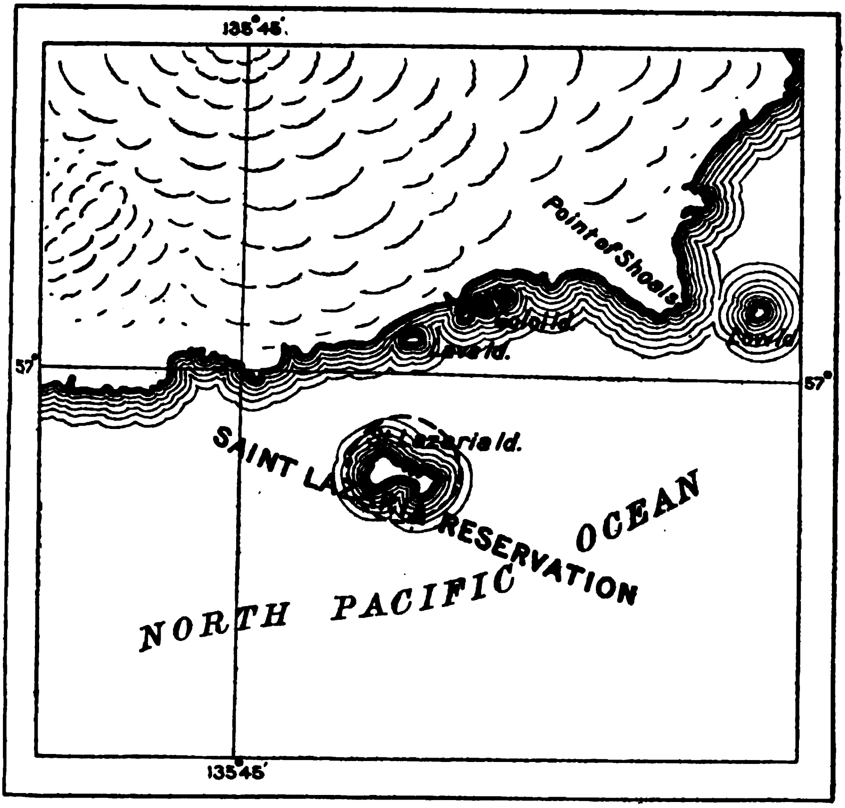
[Cir. 71]

SAINT LAZARIA RESERVATION

For Protection of Native Birds

ALASKA

Embracing Saint Lazaria island in Sitka Sound as segregated by broken line and designated "Saint Lazaria Reservation."



DEPARTMENT OF THE INTERIOR
GENERAL LAND OFFICE
Fred Dennett, Commissioner

[Clr. 71]

EXECUTIVE ORDER.

It is hereby ordered that the treeless tundra of the delta of the Yukon River, Alaska, situated west of longitude one hundred and sixty-two degrees and twenty minutes west of Greenwich and south of the Yukon River, as segregated by the broken line shown upon the diagram hereto attached and made a part of this order, be and the same is hereby reserved and set apart for the use of the Department of Agriculture as a preserve and breeding ground for native birds. It is unlawful for any person to hunt, trap, capture, wilfully disturb, or kill any bird of any kind whatever, or take the eggs of such birds within the limits of this reservation, except under such rules and regulations as may be prescribed by the Secretary of Agriculture. Warning is expressly given to all persons not to commit any of the acts herein enumerated and which are prohibited by law. This bird refuge to be known as Yukon Delta Reservation.

THEODORE ROOSEVELT.

THE WHITE HOUSE, *February 27, 1909.*

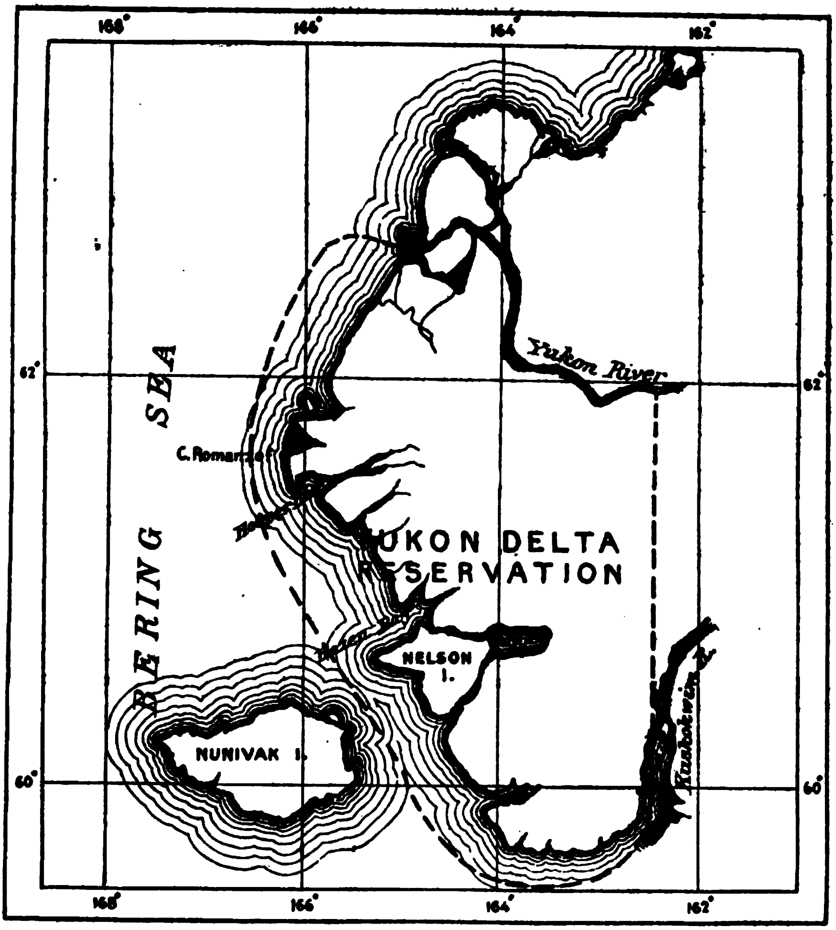
[No. 1041.]

YUKON DELTA RESERVATION

For Protection of Native Birds

ALASKA

Embracing the treeless tundra of the delta of the Yukon River, Alaska, within the broken line and designated "Yukon Delta Reservation"



DEPARTMENT OF THE INTERIOR

GENERAL LAND OFFICE

Fred Dennett, Commissioner

[Cir. 71]

EXECUTIVE ORDER.

It is hereby ordered that two small islands of the Pribilof group, located approximately in latitude fifty-seven degrees north, longitude one hundred and seventy degrees west from Greenwich, in Bering Sea, Alaska, known as Walrus island and Otter island, and located within the area segregated by the broken line upon the diagram hereto attached and made a part of this order, be and the same are hereby reserved, subject to the provisions of section nineteen hundred and fifty-six, Revised Statutes, relating to fur-bearing animals, and set apart for the use of the Department of Agriculture* as a preserve and breeding ground for native birds. It is unlawful for any person to hunt, trap, capture, wilfully disturb, or kill any bird of any kind whatever, or take the eggs of such birds within the limits of this reservation, except under such rules and regulations as may be prescribed by the Secretary of Agriculture. Warning is expressly given to all persons not to commit any of the acts herein enumerated and which are prohibited by law.

This reservation to be known as Pribilof Reservation.

THEODORE ROOSEVELT.

THE WHITE HOUSE, *February 27, 1909.*

[No. 1044.]

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* Section 5 of a bill (S. 7242, 61st Congress) "To protect the seal fisheries of Alaska, and for other purposes," which has already passed the Senate, places these islands in charge of the Secretary of Commerce and Labor.

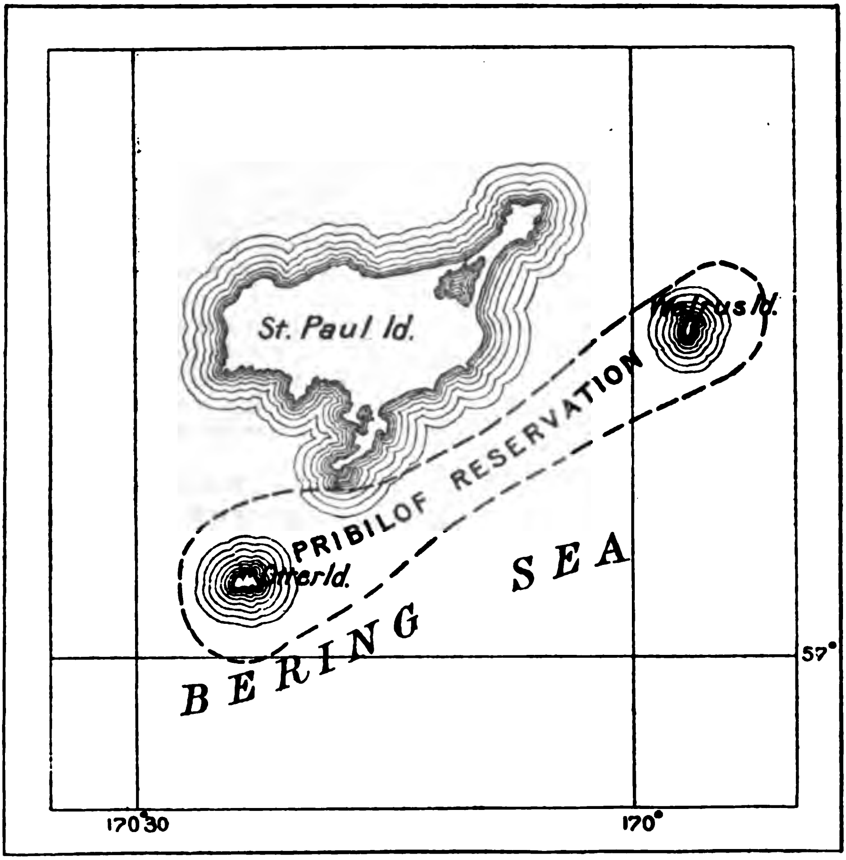
[Cir. 71]

PRIBILOF RESERVATION

For Protection of Native Birds

ALASKA

Embracing Walrus and Otter islands, of the Pribilof group as segregated by broken line and designated "Pribilof Reservation"



DEPARTMENT OF THE INTERIOR

GENERAL LAND OFFICE

Fred Dennett, Commissioner

[Clr. 71]

EXECUTIVE ORDER.

It is hereby ordered that the volcanic islets, commonly known as the Bogoslof islands of the Aleutian archipelago, Alaska, located approximately in latitude fifty-three degrees, fifty-eight minutes North, longitude one hundred and sixty-seven degrees, fifty-three minutes West from Greenwich, be and the same are hereby reserved and set apart for the use of the Department of Agriculture as a preserve and breeding ground for native birds. It is unlawful for any person to hunt, trap, capture, wilfully disturb, or kill any bird of any kind whatever, or take the eggs of such birds within the limits of this reservation, except under such rules and regulations as may be prescribed by the Secretary of Agriculture. Warning is expressly given to all persons not to commit any of the acts herein enumerated and which are prohibited by law.

This reserve to be known as the Bogoslof Reservation.

THEODORE ROOSEVELT.

THE WHITE HOUSE, *March 2, 1909.*

[No. 1049.]

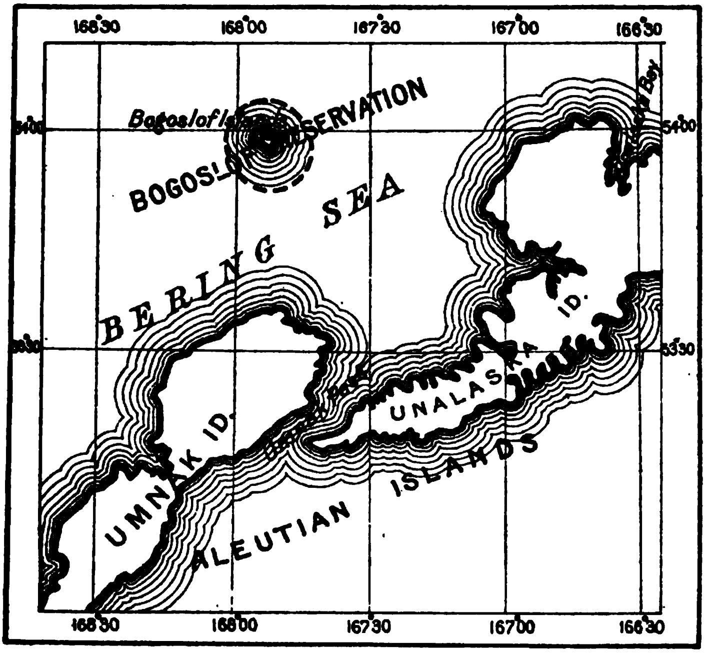
[Cir. 71]

BOGOSLOF RESERVATION

For Protection of Native Birds

ALASKA

Embracing all islands segregated by broken line and designated "Bogoslof Reservation"



DEPARTMENT OF THE INTERIOR
GENERAL LAND OFFICE
Fred Dennett, Commissioner

[Cir. 71]

O

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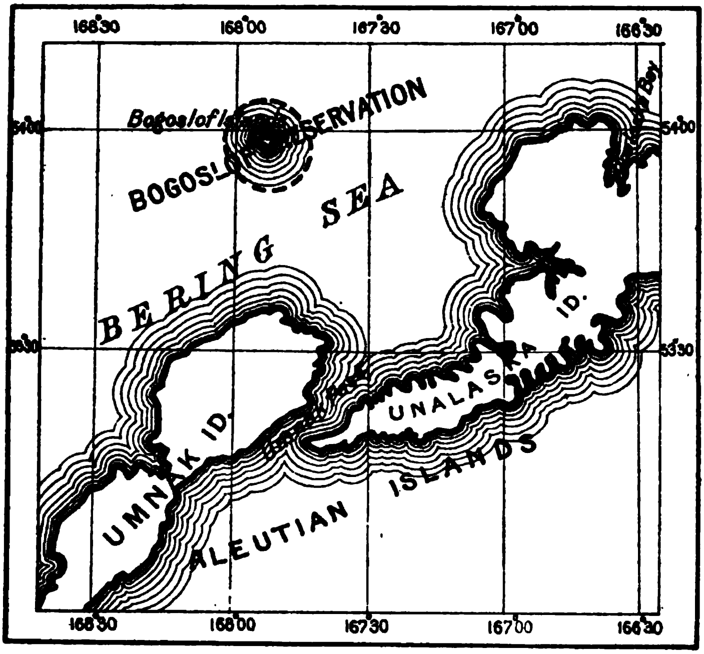

DEPARTMENT OF THE INTERIOR

GENERAL LAND OFFICE

Fred Dennett, Commissioner

[Cir. 71]

O

PROPERTY OF DIVISION OF
FORESTRY
COLLEGE OF AGRICULTURE
UNIVERSITY OF CALIFORNIA

STATE OF CALIFORNIA

FISH AND GAME COMMISSION

TWENTY-FOURTH BIENNIAL REPORT

For the Years 1914-1916

CALIFORNIA
STATE PRINTING OFFICE
1916

26231

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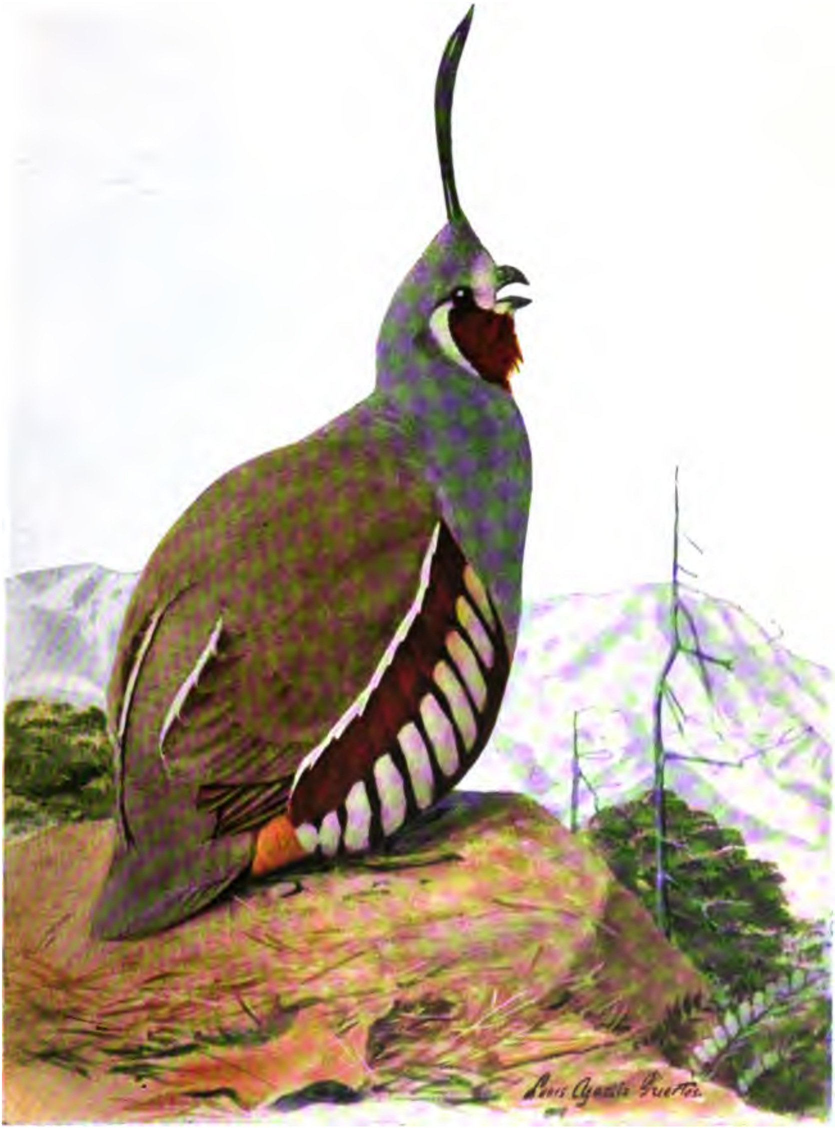


—From painting by Louis Agassiz Fuertes

MOUNTAIN QUAIL *(Oreortyx picta)*

PROPERTY OF [illegible]
[illegible]
UNIVERSITY OF CAL.

LETTER OF TRANSMITTAL.

San Francisco, California,
June 30, 1916.

To His Excellency Hiram W. Johnson,
Governor of the State of California.

Sir: In accordance with law, we submit for your consideration the twenty-fourth biennial report of the Fish and Game Commission, the same being a record of the work, receipts and expenditures for the biennial period July 1, 1914, to June 30, 1916. A summary of the work accomplished occupies the first pages, followed by the detailed reports of the department heads and district offices. The appendix contains the statistical reports. Heretofore the biennial report has been the only printed record of the commission. Current activities now are recorded in the quarterly, California Fish and Game, published under our auspices. Further detailed accounts of the work of this board can be obtained, therefore, by referring to volumes 1 and 2 of this periodical.

Respectfully submitted.

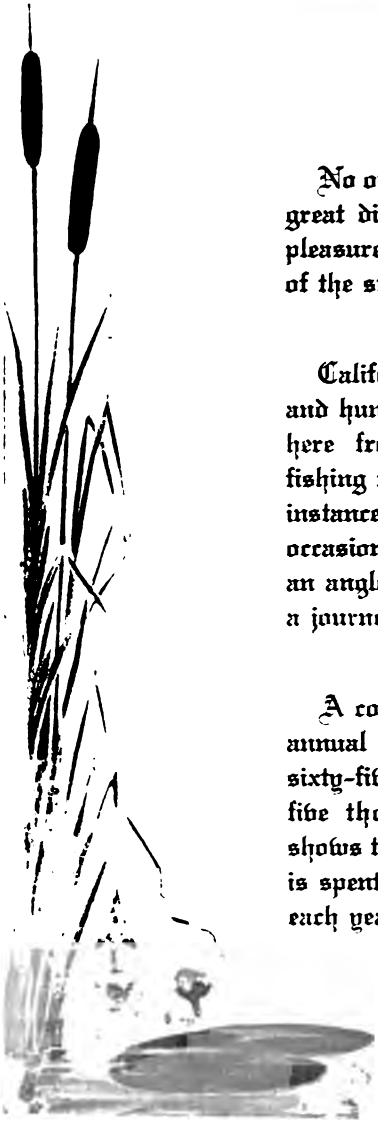
F. M. Newbert

Carl Westerfeld

M. J. Connell

Board of Fish and Game Commissioners.

By Ernest Schaeffle,
Executive Officer.



No other natural resource brings such great dividends in money, food, health, pleasure and happiness as does the asset of the state's fish and game resources.

◆

California is a sportsman's paradise and hunters and fishermen are attracted here from all over the world. The fishing near Santa Catalina Island, for instance, has been on several different occasions of sufficient interest to bring an angler from South Africa, entailing a journey of thirteen thousand miles.

◆

A computation based on the average annual expenditure of the one hundred sixty-five thousand hunters and eighty-five thousand anglers in California shows that at least twenty million dollars is spent in the pursuit of fish and game each year.

1914 TWENTY-FOURTH 1916 BIENNIAL REPORT

INTRODUCTION.

The past biennial period has been one of marked advance in the protection and preservation of wild life, the propagation of fish, the stocking of streams, the construction of fish ladders and screens, and above all in the accumulation of important data on fish and game and in the development of a public sentiment favoring wild life conservation. All of the duties of the commission as prescribed by law and above outlined have been performed as fully and faithfully as the financial and other resources have allowed.

The accomplishments here reported have been made possible through funds obtained by the sale of hunting licenses, commercial fishermen's licenses and anglers' licenses, and from fines received from violators. No appropriations have been made by the legislature. Although the larger burden of support rightly falls on the men who hunt and fish, yet, either no revenue, or revenue not in proportion to the benefit received, is derived from others having an interest in game resources. For instance, the fisherman who secures but a few fish each day which he sends to market, pays a larger license fee than the salmon cannery, which profits enormously by the fact that the fish supply is maintained. The market hunter who commercializes game pays the same license as the man who hunts but once a year. The trapper of fur-bearing mammals pays nothing towards the support of investigations needed to assure the conservation of the resources from which he draws profit. Could the license fees be made proportionate to the benefits secured, funds would be available for the further development of the game and fishery resources by the commission.

Many eastern fish and game commissions have the cooperation of numerous sportsmen's organizations, who hire attorneys and otherwise help in conserving game. There are few active organizations of this kind in California and the enforcement of the fish and game laws and efforts to conserve fish and game rest almost wholly with the commission. The problem is made still more complicated because of the lack of cooperation shown by the peace officers of the state and because

THE MEN WHO ADMINISTER CALIFORNIA'S WILD LIFE RESOURCES.

F. M. NEWBERT,
President

M. J. CONNELL
Commissioner

CARL WESTERFELD,
Commissioner

ERNEST SCHAEFFLE,
Executive Officer

THE MEN WHO ADMINISTER CALIFORNIA'S WILD LIFE RESOURCES.

W. H. SHEBLEY
In Charge Dept. Fish Culture

[illegible]
Assistant Executive Officer

[illegible]
Field Agent, Dept. Fish Culture

[illegible]
Attorney

[illegible], Assistant
In Charge Los Angeles Dist. Office

A. D. FERGUSON, Assistant
In Charge Fresno Dist. Office

N. B. SCOFIELD, In Charge
Dept. Commercial Fisheries

GEO. NEALE, Assistant
In Charge Sacramento Dist. Office

[illegible]
Superintendent State Game Farm

H. C. BRYANT, In Charge
Bur. Education, Publicity and Research

of the extraordinary size of California, which necessitates each warden patrolling an area in some instances as great as the state of Vermont. (See Fig. 6.)

Nevertheless, the fish and game laws are being enforced as never before. Not only are practically all offenders arrested, but convictions are had in almost every instance. We believe that the consistent enforcement of the game laws is a valuable educational force. Nothing deters the criminal so effectually as knowledge that all crimes will be punished with certainty. The favorable attitude shown by the people of this state at the present time is in part due to the systematic and relentless enforcement of fish and game laws.

In spite of a very severe winter in 1916, game conditions appear to be favorable. Several species of big game, such as antelope and mountain sheep, are little more than holding their own, but every effort is being made to save the remnant. Waterfowl and upland game birds are still to be found in abundance. That more and more men appear to be taking the field each year indicates that California's supply of fish and game is still large enough to encourage, rather than discourage, the hunter and angler. Increased interest in hunting and fishing is clearly evidenced by the augmented sale of licenses up to the end of the fiscal year 1914–15. Fewer hunting licenses were sold in 1915–16, but there are indications that there will be an increase this coming year. On the other hand, there was a marked increase in the number of anglers' licenses sold in 1915 (for detailed figures see p. 242).

Enforcement of Fish and Game Laws.

More arrests have been made and more convictions obtained in this than in any previous biennial period. The fish cases numbered 882 and the game cases 1205, making a total of 2087. Over 83 per cent of the total cases resulted in convictions, a higher percentage than is obtained in any other class of cases of like degree. The fines collected amounted to $33,415, and in addition 3103½ days of imprisonment were exacted from violators. Failure to secure a license led to the arrest of 424 hunters, 141 anglers and 140 commercial fishermen. Violations of the deer laws resulted in the arrest of 227 and violations of the trout laws 100. The fact that there were 115 convictions in non-game bird cases well shows the strong sentiment in favor of protecting songbirds (see p. 239). The increased number of arrests in the past few years indicates a more rigid enforcement of the game laws rather than an increase in violations.

Deputies of the commission have made 512 searches of markets, restaurants, private individuals, conveyances, etc., for illegal fish and game.

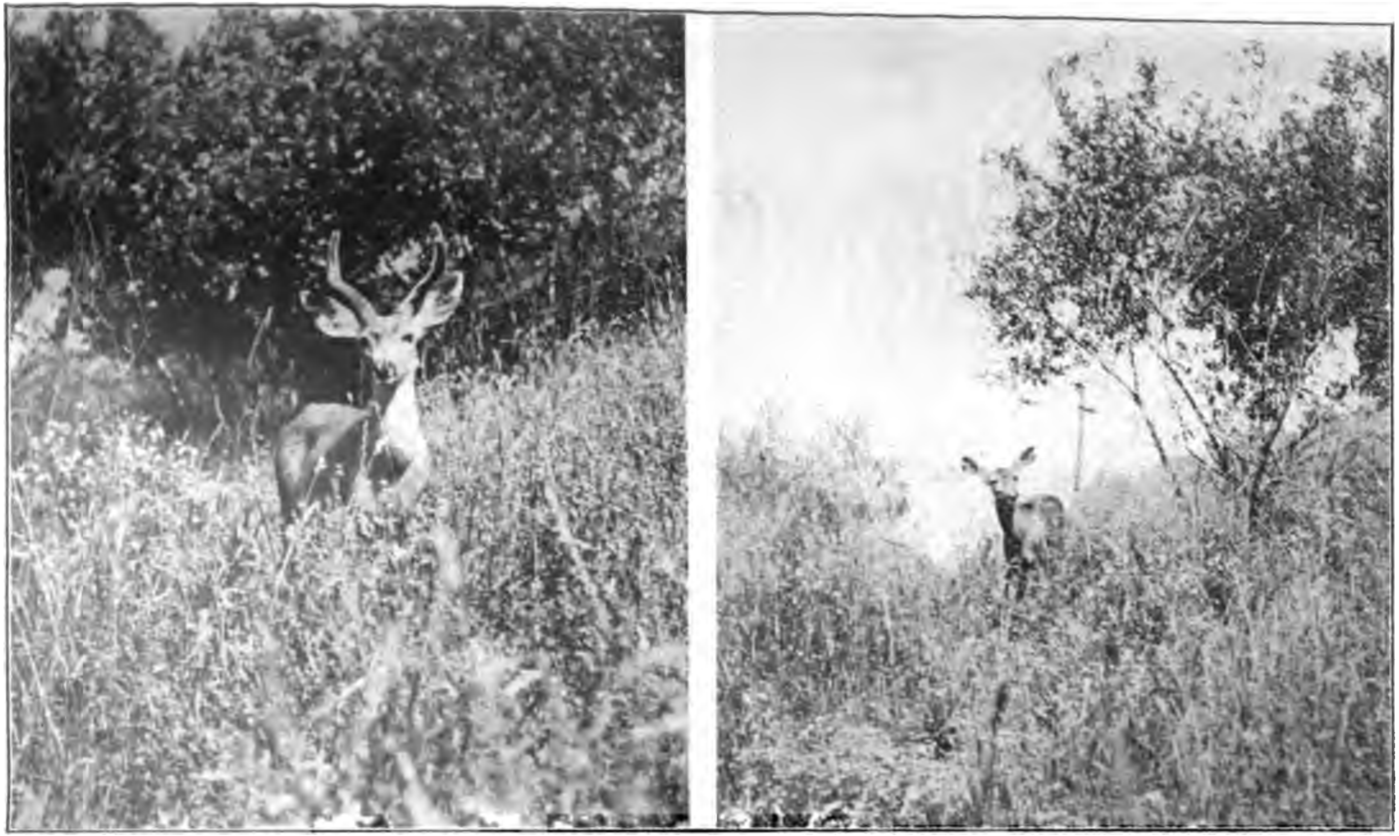


Fig. 1. Snapshots of black-tailed deer in Santa Cruz County. Photographs taken by W. E. Peckham on his ranch near Watsonville, California.

The seizures of illegal fish and game have been many. The more conspicuous totals are: ducks, 6695; geese, 1265; quail, 432; shore birds, 120; rabbits, 462; deer meat, 3802 pounds; trout, 5293 pounds; striped bass, 3900 pounds; salmon, 4195 pounds. All wholesome fish and game confiscated is donated to public and charitable institutions, from whom many grateful letters of acknowledgment have been received. Illegally used fishing apparatus, including nets, lines, etc., to the number of 337, have been confiscated. These represent about 12,668 fathoms, or 76,008 feet. This apparatus, after condemnation in superior courts, is destroyed or sold in accordance with law.

The Protection of Fish and Game.

Since the development of public sentiment is necessary to the proper conservation of wild life, emphasis has been placed on educational and publicity work. The Bureau of Education, Publicity and Research has been active in placing before the people of the state, by means of lectures, a quarterly bulletin, and newspaper items, the work of the commission and the needs of fish and game. The motto of this department is "Conservation Through Education." The quarterly, CALIFORNIA FISH AND GAME, has furnished a medium for the publication of statistical and financial reports and of facts regarding fish and game resources. This policy of keeping the people of the state informed of the status of, and the activities of the commission in conserving fish and game, has been instrumental in winning needed support for conservation measures and in increasing interest in the bird and animal life of the state. In preparation for further work of this kind and of future legislation a great deal of data has been accumulated. For example, the kill of deer has been annually compiled in order that there might be a basis for regulating the annual kill to the supply. Material in the form of teachers' bulletins has been issued and the attempt made to stimulate the teaching of nature study in the public schools. The proper education of children is a fundamental conservation measure. Such research problems as the food of the roadrunner, the food of ducks, and the status of introduced game birds have been undertaken and other economic and scientific investigations are contemplated.

The prosecution of such publicity as is being furnished by the Bureau, backed as it is by scientific research, will necessarily bring about a new era as regards wild life conservation. Knowledge of wild life and its needs assures good laws and the efficient patrol force helps to assure consistent obedience of them.

The newspapers of the state, especially those of southern California, have shown great interest in fish and game matters, and the publicity given by them has greatly aided the commission in successfully carrying forward its work.

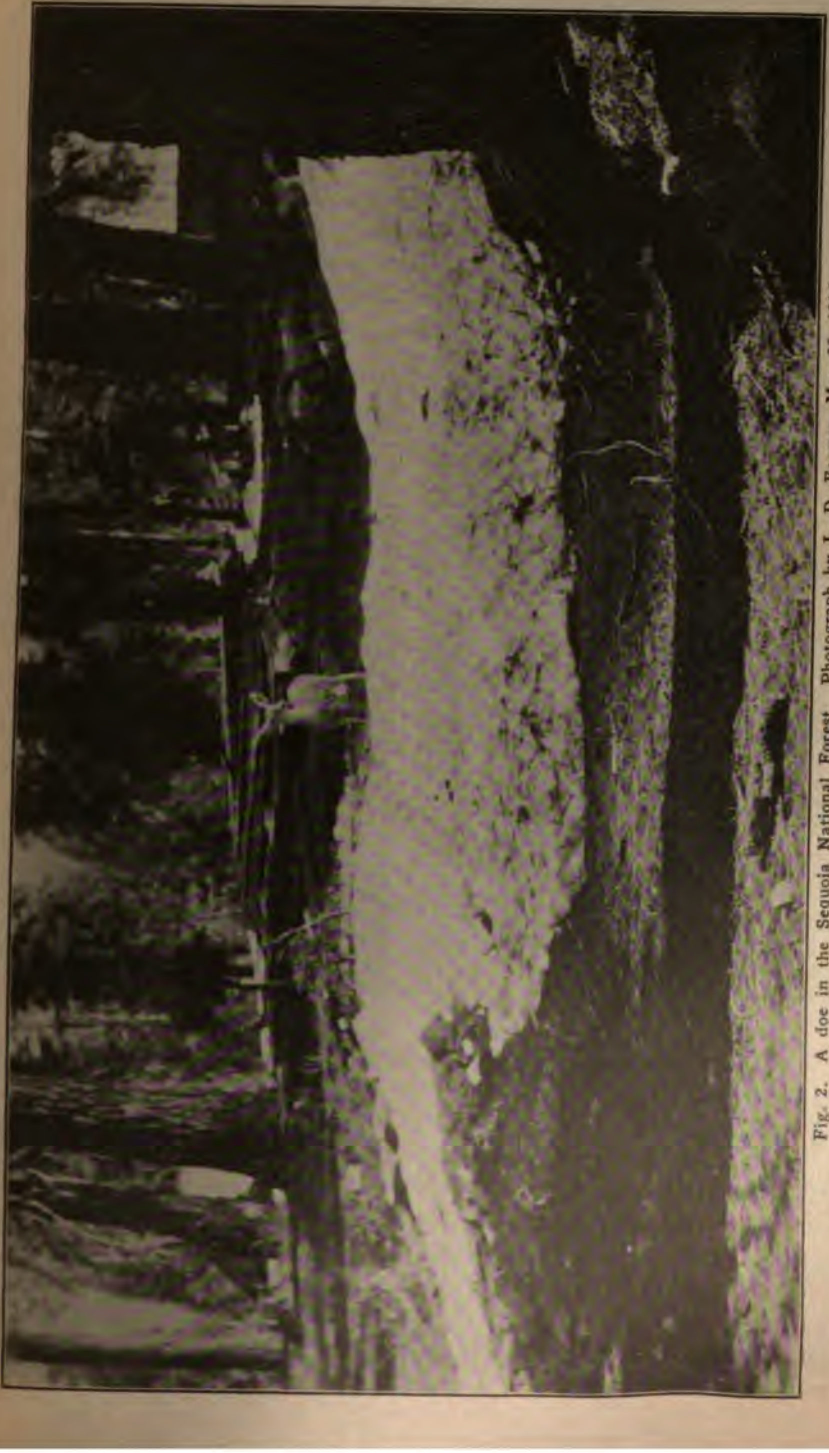


Fig. 2. A doe in the Sequoia National Forest. Photograph by L. D. Farmer, May 28, 1916.

At the Panama-Pacific International Exposition, the Fish and Game Commission, in cooperation with the California Academy of Sciences, installed an extensive exhibit depicting the wild life resources of California. Several habitat groups of game mammals were conspicuously placed in appropriate surroundings. To the south was a fine group of desert mountain sheep, to the west a group of black-tailed deer and to the north a typical hunter's camp among redwoods. In the camp were hung some of the different species of game birds, and tree squirrels and mountain blue jays were to be seen perched in the trees overhead. Between the major groups and placed in rocky caves were a black bear watching her cubs at play, and a mountain lion guarding her kittens while they fought over a dead fawn. An aquarium contained live golden trout from the Whitney region and representatives of other trout found in the state. Attractive colored booklets, giving facts in regard to fish and game and a statement of the reasons for saving the wild life resources of the state, were distributed by the assistant in charge of the information booth. Exhibits were also installed at the State Fair, the Chico Fair and at other county fairs.

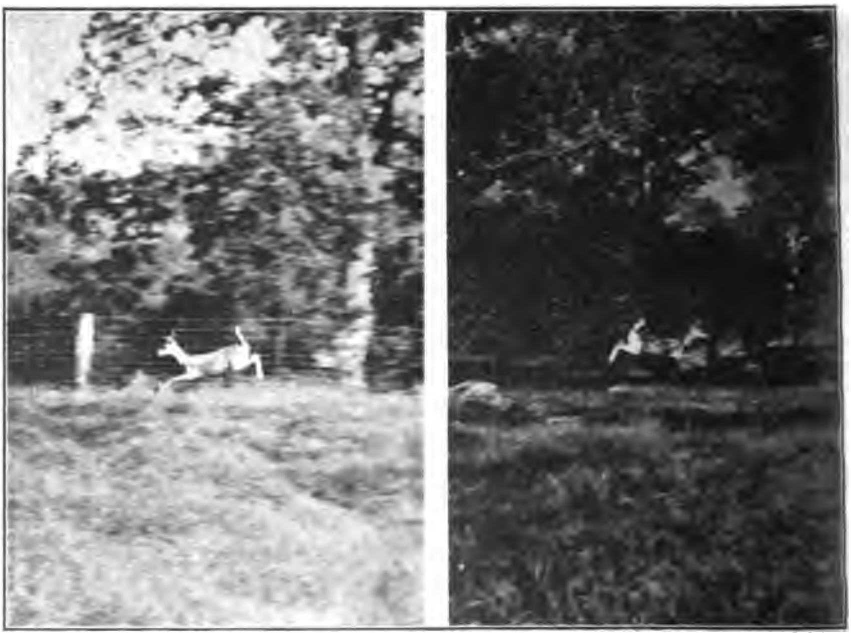


Fig. 3. Studies in deer locomotion. Photographs by E. W. Smalley.

Under the direction of Charles R. Gilmore, engineer-draftsman, the work of recording on maps accurate data on lakes and streams, which was instituted in 1912, has been continued. Eventually these maps will show the location of lakes and streams, the volume of water in

each, the fish plants made with data on the kind of fish, by whom planted, when planted and the expense attached thereto, and the ownership of the land bordering the principal fishing streams. The data will be of particular value in connection with future fish planting operations.

Proper fish and game protection and legislation must be based on accurate information on the abundance, distribution, food, habits and life history of each fish, bird and mammal concerned. This information is obtainable only through scientific investigations and the systematic collection of data. Two departments of the commission, the Bureau of Education, Publicity and Research and the Department of Commercial Fisheries, are actively engaged in making available the data necessary to the proper and efficient conservation of fish and game resources. Furthermore, the records of the status of fish and game and of the activities of the commission are being kept in such a way that endeavors in the future may profit by them and laws and conservation measures be planned accordingly.

Game Refuges.

In order to provide safe breeding grounds for game birds and mammals a number of game refuges have been established by legislative enactment. Prior to 1915 there had been created but two large state refuges. These were the Pinnacles National Forest Monument, situated in the counties of San Benito and Monterey, and a portion of the Cleveland National Forest, in Orange and Riverside counties. To these were added in 1915, an area in California Redwood Park, in Santa Cruz County, commonly known as the Big Basin, a portion of the Trinity National Forest, in Trinity County, and a large part of the Angeles National Forest, in Los Angeles and San Bernardino counties, the Trinity refuge comprising 64,000 acres and the Angeles 600,740 acres (see Fig. 6).

In addition to these state refuges there are a number of national reserves, such as the Klamath Lake Bird Reservation, in Siskiyou County, the Clear Lake Bird Reservation, in Modoc County, and the Farallone Bird Reservation, on the Farallone Islands. The national parks should be counted as refuges along with these reservations, for in them no hunting is allowed.

The combined state game refuges now occupy an area almost equal to the state of Rhode Island. There are 782,998 acres of national forest lands set aside as game refuges, where all hunting is prohibited, except that for predatory animals, under permit.

Still other additions to the game refuges of the state have been made under the law providing "that any person, firm or corporation, owning and in possession of patented land in the state of California embracing

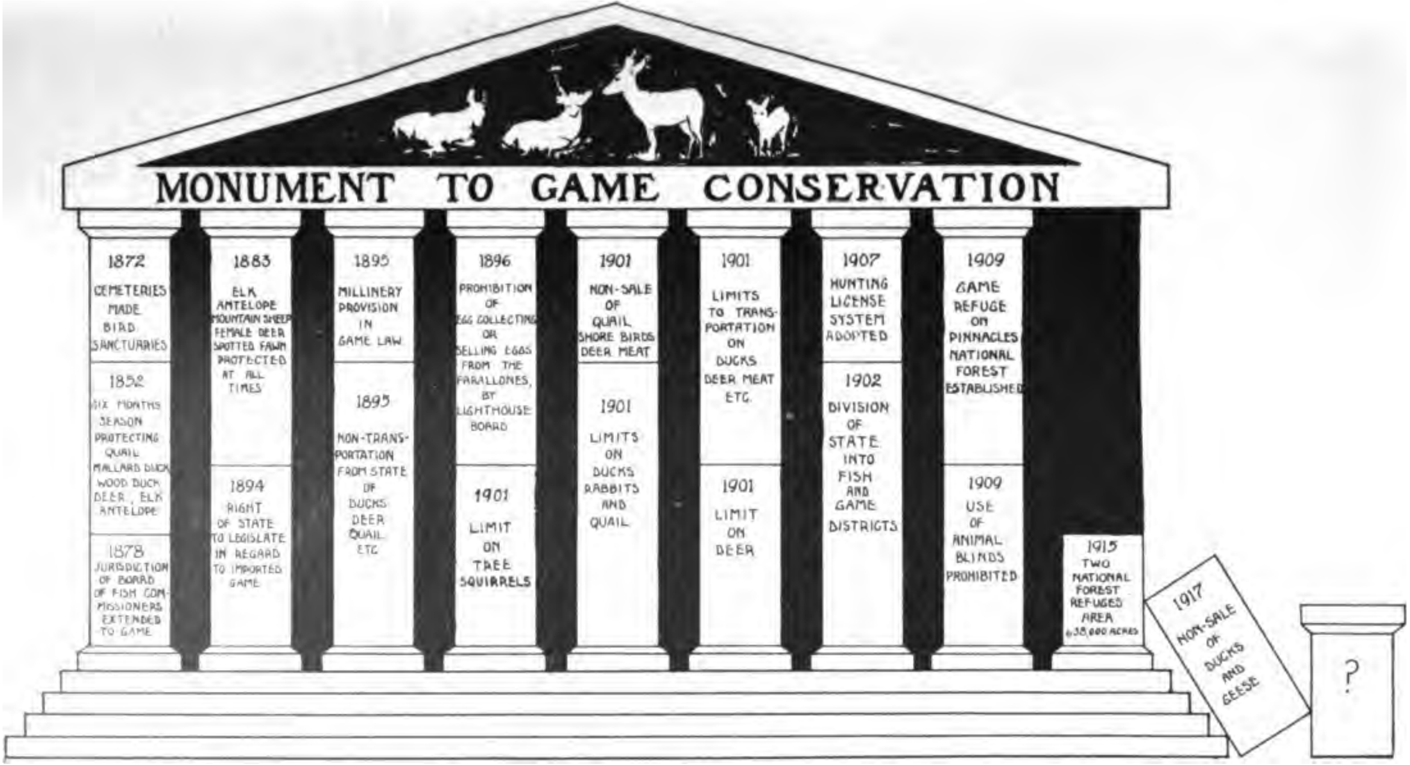

MONUMENT TO GAME CONSERVATION
1872
CEMETERIES MADE BIRD SANCTUARIES
1852
SIX MONTHS SEASON PROTECTING QUAIL MALLARD DUCK WOOD DUCK DEER, ELK ANTELOPE
1878
JURISDICTION OF BOARD OF FISH COMMISSIONERS EXTENDED TO GAME
1883
ELK ANTELOPE MOUNTAIN SHEEP FEMALE DEER SPOTTED FAWN PROTECTED AT ALL TIMES
1894
RIGHT OF STATE TO LEGISLATE IN REGARD TO IMPORTED GAME
1895
MILLINERY PROVISION IN GAME LAW
1895
NON-TRANSPORTATION FROM STATE OF DUCKS DEER QUAIL ETC
1896
PROHIBITION OF EGG COLLECTING OR SELLING EGGS FROM THE FARALLONES, BY LIGHTHOUSE BOARD
1901
LIMIT ON TREE SQUIRRELS
1901
NON-SALE OF QUAIL SHORE BIRDS DEER MEAT
1901
LIMITS ON DUCKS RABBITS AND QUAIL
1901
LIMITS TO TRANSPORTATION ON DUCKS DEER MEAT ETC.
1901
LIMIT ON DEER
1907
HUNTING LICENSE SYSTEM ADOPTED
1902
DIVISION OF STATE INTO FISH AND GAME DISTRICTS
1909
GAME REFUGE ON PINNACLES NATIONAL FOREST ESTABLISHED
1909
USE OF ANIMAL BLINDS PROHIBITED
1915
TWO NATIONAL FOREST REFUGES AREA 638,000 ACRES
1917
NON-SALE OF DUCKS AND GEESE
?

Fig. 5. A monument to game conservation in California. Much has been accomplished, but there is still much to be done.

an area of not less than 160 acres, may transfer, by an instrument in writing, * * * to the state of California to preserve and protect all wild game on the land described therein, for a period of not less than ten years." On February 1, 1916, John S. Bryan of Hollister transferred to the state of California the right to preserve and protect for ten years all wild game on his ranch of 8570 acres, situated in the Gabilan Range, in Monterey and San Benito counties. The establishment of other refuges of the same sort is contemplated. The creation of a reservation around Santa Catalina Island, where all fishing except with hook and line is prohibited, will improve, doubtless, the angling for large game fishes. The waters surrounding the island in reality become a refuge for the small fish which form the food of the tuna, black sea bass, albacore and yellowtail.

The wisdom shown in providing sanctuaries where game may increase undisturbed is already apparent. These sanctuaries will in time act as important and permanent sources of supply, the increase spreading into the surrounding country to furnish food and sport.

Legislative Results.

Among the many important laws passed by the last legislature was the one enlarging the jurisdiction of the commission. For many years the board had legal jurisdiction only over fish. Later game was placed under its control. The extension of its control so that the "protection and preservation of wild mammals, wild birds, fishes, mollusks, crustacea and all forms of aquatic animals and plants" comes under its jurisdiction, has made it possible to more effectually administer the wild life resources of the state. The song-birds are a natural resource as well as the game birds, and the conservation of the plankton of the sea is a prerequisite of abundant fish life. The existing interrelation between the different forms of wild life is so intimate that it were folly to administer one without the other.

The attempt to redistrict the state more satisfactorily, although perhaps causing some inconvenience on the part of the hunter and fisherman, has been productive of beneficial results. Not all kinds of fruit grow in the same locality. Nor does the same kind of fruit ripen at the same time in the lowlands and in the high mountains. The same is true of game and fish, and because there is such a wide variety of species and of conditions, conservation is dependent upon a districting system that will equalize as nearly as possible the hunting and fishing season and the privilege granted the hunter and fisherman. It may appear sometimes that the arbitrary lines drawn work an unnecessary hardship, but it should be remembered that the lines must be drawn somewhere.

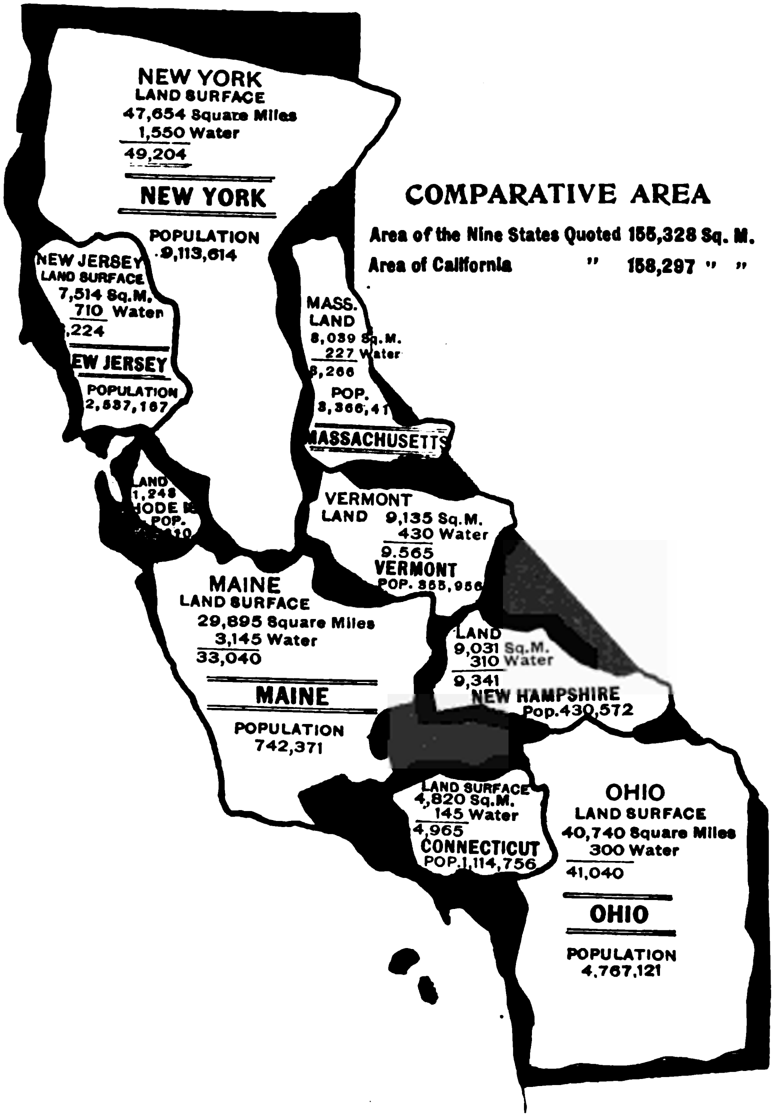


Fig. 6. Map of California, showing comparative area. Courtesy Southern Pacific Company.

Believing that the commercialization of game means early extirpation, the commission has continuously advocated a law prohibiting the sale of all game. Laws already prohibit the sale of all game birds with the exception of ducks and geese, but these birds have been killed in large numbers for the market. The point at issue, however, is more largely the control of the market hunter rather than the actual sale of birds on the market. Experience has shown that nothing short of absolute prohibition of sale will successfully stop the operations of the man who hunts for market. Furthermore, the fact that 300,000 ducks were sold in the markets of San Francisco alone in 1912 is evidence that the sale of ducks must be stopped if an undiminished supply is to be maintained. The result of the referendum vote on the nonsale-of-game bill was an indication of a lack of knowledge of the facts rather than a condemnation of the law. A valid principle underlies this needed law and in justice to neighboring states, all of which have such a law, California should see that market hunting is eliminated.

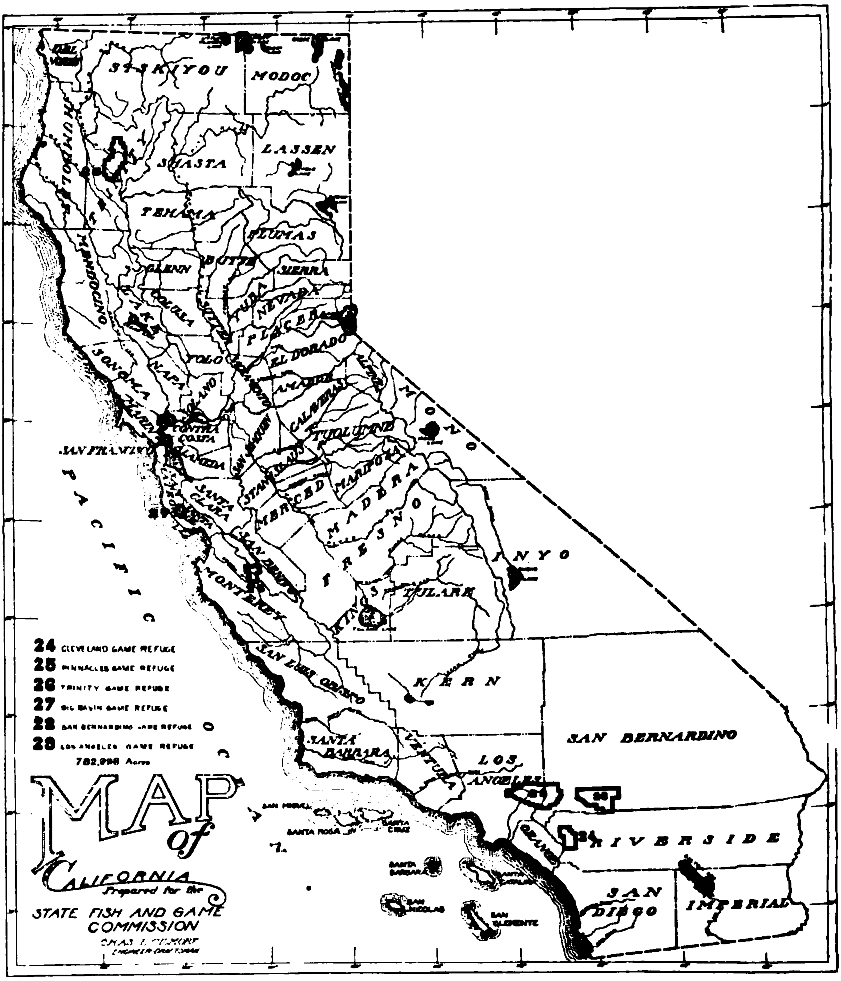


Fig. 7. Map of California, showing state game refuges.

Other laws enacted in 1915 are proving their worth. The state laws were made to conform with the Federal Migratory Bird Law, thus shortening several seasons and giving needed protection to geese. Bag limits on waterfowl and upland game birds were also materially reduced, thus going a step farther than the federal law. The additional protection given salmon by the prohibition of netting in the Sacramento River above Vina and the making of a closed season from May 15th to the close of the year for the district between Vina and Colusa, has resulted in a notable increase in the fish ascending the McCloud River. The legislation regulating the operations of commercial fishermen is assuring the conservation of the fishery resources. The law giving protection to the spiked buck has been widely observed and unanimously indorsed. The uniform season for rabbits and quail has been instrumental in keeping the gunner out of the fields until the young quail have matured. Although the rabbit may sometimes be a pest, yet if we profit by the experience of Pennsylvania this game mammal of the common hunter must be carefully protected. Pennsylvania is now attempting to restock the state with rabbits. The dove season is now much more satisfactory and band-tailed pigeons have received needed protection. The elimination of "bull hunting" has proved to be a wise conservation measure. The future will still more clearly demonstrate the value of the new and amended fish and game laws of the 1915 legislature.

The District Offices.

On account of the vast area of our state and in order that the work of the commission in the various parts might be expedited, there have been created three administrative divisions, the San Francisco, Sacramento and Los Angeles. The head office is located in San Francisco. Here are also the offices of the departments of Fish Culture, Commercial Fisheries, Licenses and Bookkeeping.

Assistants working in the San Francisco Division patrol an area covering 46,000 square miles with a population of nearly 1,500,000. The Sacramento office attends to the work of the commission in the Sacramento Valley and the northeastern part of the state, covering an area of 43,347 square miles with a population of nearly 500,000. The Los Angeles office is in charge of the southern part of the state which has an area of 56,435 square miles and a population of nearly 1,000,000. For several years, the commission maintained an office in the San Joaquin Valley at Fresno. It was deemed expedient to combine this office with the San Francisco office early in the year 1916. Mr. A. D. Ferguson, who had been in charge since the division was created, was made Field Agent with duties extending into all parts of the state.

Conspicuous among the activities of the Sacramento Division have been the winter feeding of game and the seining of fish from overflowed lands.

During the severe winter 1915–16 it soon became apparent that large numbers of deer and quail would starve unless feed was provided for them. Deputies were ordered to procure feed and to stimulate the interest of others in the work. As a result. many hundreds of deer and quail were supplied with food until the melting of the snows again furnished them a natural supply (see Figs. 8, 9, 10 and 11).

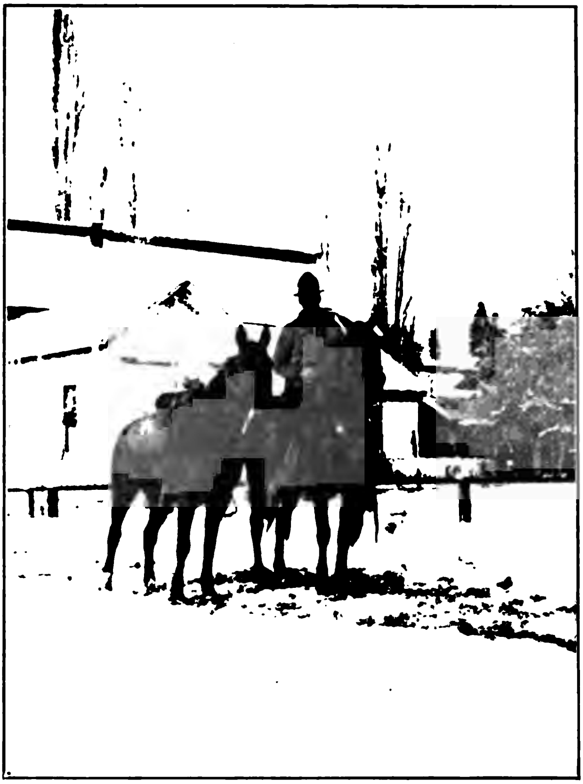


Fig. 8. Deputy O'Connor of Grass Valley, Nevada County, leaving on horseback to feed quail during severe weather, winter 1915–1916.

The drying up of overflowed bottoms in the Sacramento Valley annually causes a great loss in fish life. No more practicable method of conserving the valuable fishery resources of the great valleys has been found than is demonstrated in the efforts to seine out and plant in other places the fish which would otherwise die with the drying up of these overflowed areas (see Figs. 12 and 13). The Sacramento District office has carefully watched the areas where this danger exists and has been instrumental in saving thousands of black bass, perch, catfish, crappie and sunfish.

Fig. 9. Deputy E. H. Ober of Big Pine, Inyo County, and assistants feeding quail during severe weather, winter 1915–1916.

Fig. 10. Valley quail being fed at Bishop, Inyo County, during severe weather, winter 1915-1916. Thousands of quail were saved because fed by Fish and Game Commission deputies.

In addition to routine work the Los Angeles District office has carried on a noteworthy publicity campaign. The activities of the Southern Division office and the fish and game resources of the south have been given wide publicity. In addition study has been made of the commercial fisheries, which are yearly growing more important (see pages 80–100). The maintenance of a breeding stock of quail in Inyo County is due largely to the efforts of this division in feeding the birds during the severe winter weather of 1916. Many deer were also saved from starvation.

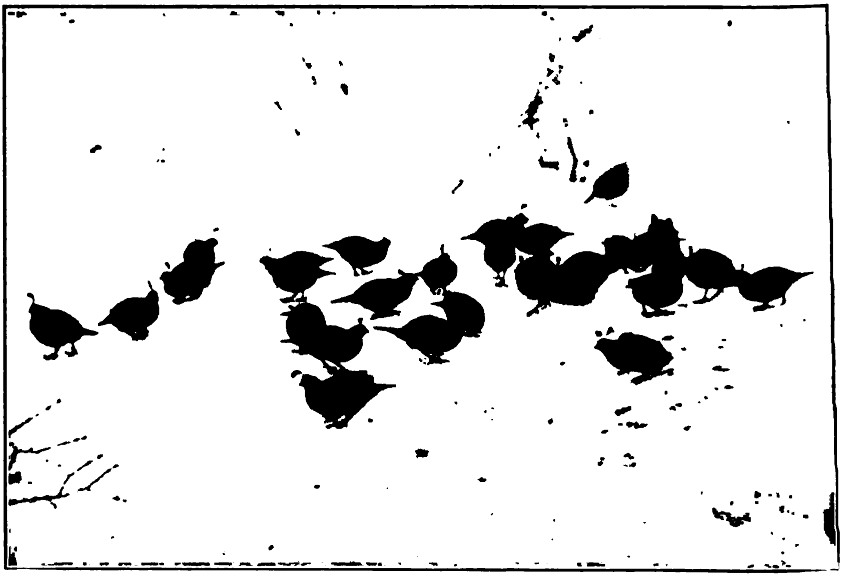


Fig. 11. Feeding quail, winter 1915–1916, at Bishop, California.

The San Francisco District office has a most difficult problem in the large alien population of the Bay cities. Effort has been largely concentrated on the strict enforcement of the fish and game laws pertaining to the coast districts (see pages 135–137). The legal shipments and sale of game in San Francisco have been carefully supervised, and due to the activities of the efficient patrol service the illegal shipment and sale of game has been practically eradicated. The transfer companies, which were subterfuges by the commission houses to evade the limit law on ducks, have been put out of business and further attempts to evade the law by making parcels post shipments have been prevented.

The Fresno Division office has been instrumental in greatly improving fishing conditions in the Sierras. Trout fry have been carried by pack train to the most isolated streams and lakes. The range of the beautiful golden trout has been greatly extended and several stocking experiments

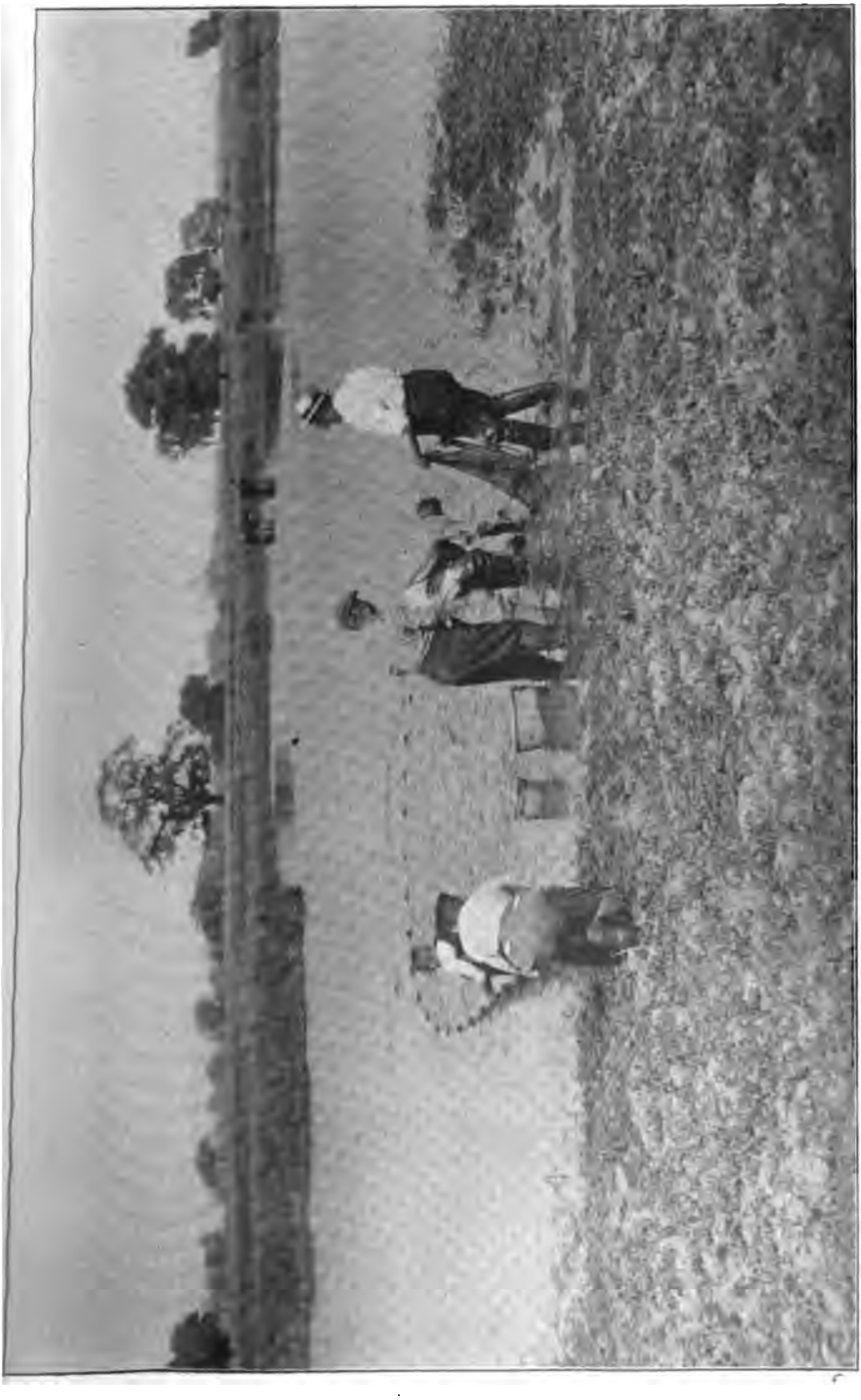


Fig. 12. Seining fish from overflowed areas in the Sacramento Valley. Photograph by McCurry Company.

Fig. [illegible]. Seining fish from overflowed areas. Thousands of fish are saved from death with the drying up of the ponds and are used for planting in streams. Photograph by McCurry Company.

of value have been instituted. Of particular interest is the experiment now under way, devised to test the present theory regarding steelhead trout. A number of these trout have been placed in barren waters in the high Sierras where they will be landlocked. It is hoped that the experiment will demonstrate whether this sea-run form will revert quickly to the landlocked form (see pages 147–153).

The attempt has been made to stop, as far as possible, the pollution of waters by refuse from wineries, sugar factories, gas plants, and oil refineries. Many investigations have been carried on to determine the amount of pollution, and many manufacturing companies have been forced to install filters and other devices for preventing pollution. Marked improvement is to be noted in the type of equipment used. The old straw filter used for obtaining lampblack has been succeeded by three types of mechanical filters—the Oliver, the Kelly and the Butters, the latter of which appears to be the most successful. We are glad to acknowledge the cooperation of all of the larger companies. They have willingly expended thousands of dollars in the attempt to prevent waste destructive to fish from entering the waters of this state. For a more detailed report, see pages 127–134.

There has been a steady reduction in the number of lion bounties paid and it is evident that mountain lions have become greatly reduced in number. As a consequence thousands of deer are saved each year. Bounties were paid on 162 lion scalps in 1915 and on 111 between January 1 and June 30, 1916, as against 482 in 1908, 361 in 1909 and 333 in 1910. Without taking into consideration cattle and sheep, the saving in deer alone has more than justified the total expenditure of $49,160 during the last nine and one-half years, during which time the bounty has been in force. We are glad to report that there has been little or no fraud connected with the payment of lion bounties. A claim for each lion must be made upon a blank form and this must be signed by the claimant and three witnesses and acknowledged before a notary or justice of the peace. In addition, the claim must be accompanied by an account of the pursuit and killing of the lion, giving details as to the method used, the number of deer carcasses left by the animal, and such other facts as may be of assistance in determining the damage done to deer and other game. Two litters of young animals sent in were found to be on examination the young of coyotes. There was no evidence, however, that the men making application for bounties on these animals were not sincere in their belief that they were young mountain lions. It may be that the lion bounty should be increased in order to still further reduce the species.

The above are a few of the many activities of the commission directed toward the better protection of fish and game.

The Patrol Force.

There are in the employ of the California Fish and Game Commission sixty-eight assistants or deputies who do active patrol duty. Additional temporary assistants are employed during the open seasons. The regular assistants are stationed in various parts of the state where fishing and hunting conditions are the best and in centrally located places from which they can cover to the best advantage the district allotted to them. The assistants are not bound by any arbitrary lines but are expected to extend their activities into adjoining districts. In this way, there is left no unguarded area such as there would be if they were bounded by fixed lines.

Each assistant is encouraged to work with the one in charge of the adjoining district and whenever help is needed to bring violators to justice, the two are expected to assist each other as fully as possible. Deputies are often concentrated in one locality to apprehend chronic violators and new men are sent into old territory in order to make the work more effective.

All of the employees and assistants of the Fish and Game Commission are now under civil service regulations. The assistants are selected after a rigid examination. This examination, consisting of two parts—one written, the other oral—is given by a board of examiners, the members of which have had many years of experience in the enforcement of the game laws. In the oral examination, the candidate is called before the examiners. Each examiner then checks on a form the various characteristics of the applicant—his appearance, health, decision, manner, information, reliability, ambition, body-build, alertness—in fact, every characteristic that has any bearing upon the duties to be performed. Questions are asked that are intended to bring out the candidate's understanding of game and fish conditions and his ability to look after himself and camp stock under all conditions and his understanding of what game conservation really means. In this way, the candidates peculiarly fitted for practically every branch of the service are secured. Although ratings are made separately by each examiner, invariably the same conclusion in regard to the candidate's fitness is reached. The written part of the examination includes questions that will bring out the candidate's idea as to the meaning of the various laws, his ability to tell from hypothetical questions as to whether a violation has occurred and his knowledge of the habits of the various species of game to be found in the state. None of the questions is particularly difficult and should be found easy by the candidates having a general knowledge of the duties of an assistant and of the interpretation of the game and fish laws. By reason of the care taken in the selection of assistants, it will be possible in a few years to have a force of men who not only have the natural ability, but who have a very deep interest

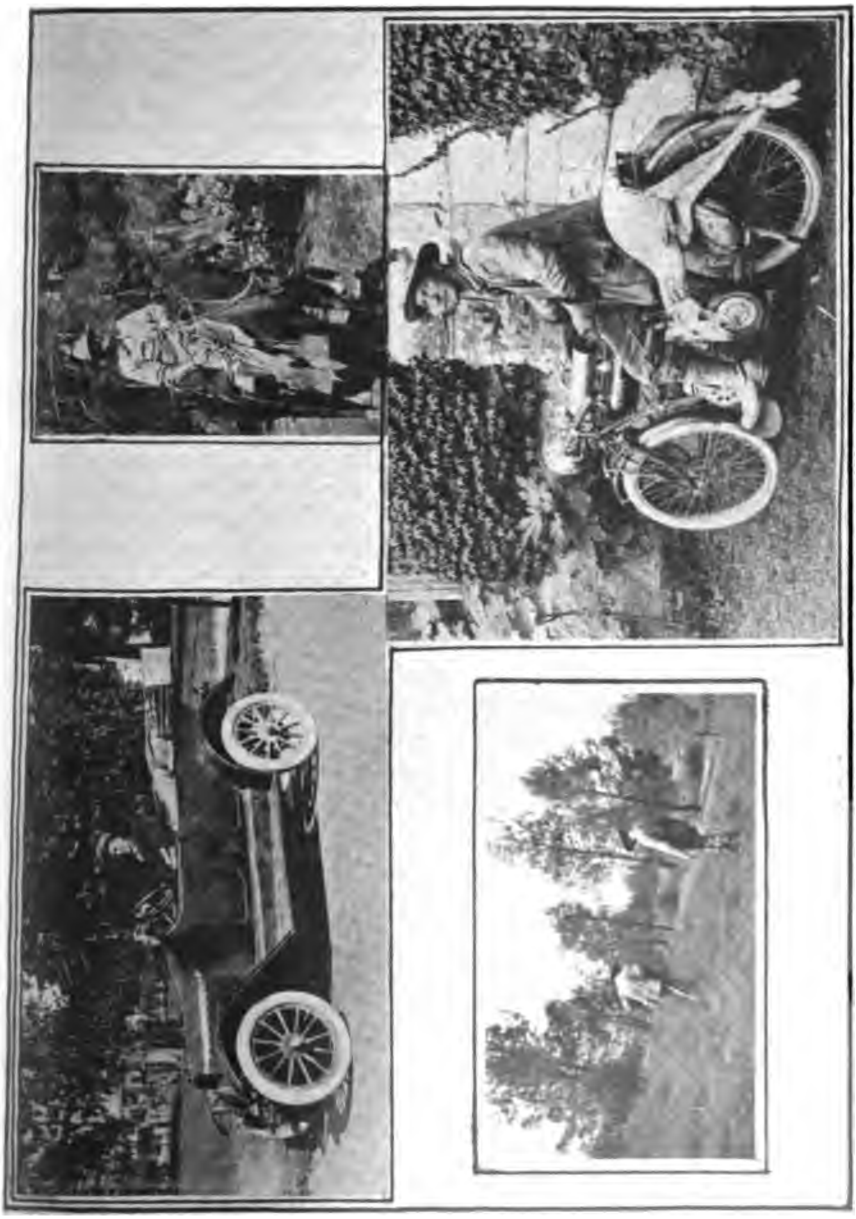


Fig. 14. The deputy at work. Transportation is made by automobile and motorcycle, and on horseback and on foot. The deputies pictured are I. L. Koppel, Raymond O'Connor, J. H. Hill and C. A. Scroggs.

in the conservation of fish and game. Without these qualifications no one who is charged with the enforcement of the game laws can be successful.

During the past several years, the Fish and Game Commission has had an auxiliary force of unsalaried assistants. In certain instances excellent results were obtained through these men, but in general the results were very disappointing. Most of them did not take an active interest in law enforcement. Some of them even used their badge to cover up their own and their friends' violations. Frequently very flagrant violations were overlooked and more frequently petty cases were sworn to that should have been handled outside of court. At the time that the Workmen's Compensation Act went into effect, it was realized that the expense of carrying insurance on the army of special assistants was not warranted—a ruling from the Attorney General being to the effect that the commission was liable for accidents that might occur. On this account it was decided to cancel the appointments of all special deputies.

A "Manual for Deputies," arranged by Messrs. A. D. Ferguson, George Neale, R. D. Duke, J. S. Hunter, and W. H. Shebley, was published in May, 1914. This manual deals with the more important phases of a deputy's problems, and gives an insight into the powers and duties of deputy fish and game commissioners. It is of particular value to the newly appointed officer. The six divisions of the Manual appear under the heads: Qualifications, Arrests, Expense, Routine and Forms, Decisions and Civil Service Regulations. The following quotations from Part I, show the standards which are set for deputies of the California Fish and Game Commission:

> *Qualifications*—A deputy fish and game commissioner should be honorable in all his dealings; whether with the public, his superior officers or his fellow deputies. The eye of the public is upon him; the honor of the commission is in his keeping. A deputy is out of place in the great and important work of conservation in which the California Fish and Game Commission is engaged unless he can command the respect of those with whom he comes in contact. Even the most persistent lawbreaker is bound to respect the self-respecting, upright officer, though he bring him to justice and punishment. * * *
>
> *Energetic*—The good things in his line do not come to the deputy who waits for them. The duties of the deputy fish and game commissioner are peculiar in that—unlike a sheriff or other peace officer, who usually acts upon information furnished by others—the deputy must, from the nature of things, himself take the initiative. He must not only do patrol duty in the ordinary sense of the word, but he must endeavor to anticipate the movements of those who would violate the fish and game laws. He must be ever alert. He should thoroughly post himself on those sections wherein

> the fish and game laws are most frequently violated. He should study the methods of the professional game law violators. He should cultivate the friendship of law-abiding people and open channels for information concerning those things of which he ought to get early knowledge.
>
> *Courageous,* but courteous, is a qualification which goes far in the making of a good officer. A timid man can accomplish little; an overbearing one can do more harm than good. * * *
>
> *Tactful*—Poise is essential. A reputation for making arrests on frivolous grounds or for being too easily persuaded to drop prosecution is alike detrimental to the deputy's chances for efficiency. No hard and fast rule can be laid down as to when to make arrests; the deputy must exercise his judgment. But on general principles no consideration of prominence or influence, when the offending party is of the age of mature judgment, should cause the deputy to deviate from his attitude of dispassionately but firmly insisting that the law be vindicated. * * *
>
> *Relations with other officers*—The position of deputy fish and game commissioner is unique as compared to other officers of the state, county, or municipal governments, inasmuch as his duties are at once executive, administrative and educational. While his jurisdiction conflicts in no way with that of other peace officers nor theirs with his, yet sheriffs, constables, policemen, harbor officers, and inspectors of various arms of municipal governments are all in a position to render him invaluable assistance. The deputy should earn the confidence and respect of all such officers that their cooperation may be ready and voluntary. * * *

Under the heading "Arrest" the deputy is directed when to make an arrest, how to make an arrest, what degree of force may be used, and what disposition is to be made of a prisoner. What kind of expenses may be incurred by the deputy in the discharge of his duties, and the manner of presenting his claims for reimbursement is described under the heading "Expense Claims."

The efficiency of the patrol service has been greatly improved in the past few years because of the increased facilities of transportation which have been provided. Most deputies now have automobiles; others motorcycles. An allowance of a certain amount per mile, while the automobile is used in connection with a deputy's work, covers expenses and upkeep. The distance which can be covered in patrol work is thus increased many times and the tracing of all violators made possible. Four patrol boats are now in service and Evinrude motors make the use of smaller patrol boats possible on the rivers during certain seasons. However, a large patrol boat for use in enforcing commercial fisheries regulations along the southern California coast and offshore islands is essential to the proper enforcement of laws and the gathering of needed scientific data.

Propagation of Game Birds.

Little effort has been made to continue the introduction of foreign game birds. Believing that sufficient attempts have been made to stock the state with ring-necked pheasants, and that the game farm has not proved its worth, the efforts at propagation on the farm have been curtailed. Consequently, but few ring-necked pheasants have been reared, and only a few hundred birds have been liberated. In order that breeders might be furnished information as to the possibilities in quail and duck breeding, the farm has been stocked with valley quail and wild ducks and experiments carried on to determine the success which can be obtained in artificially rearing them. The main justification for a game farm appears to lie in its value as a station for carrying on breeding experiments, the results of which will benefit game breeders, rather than in its value as a practical means of increasing game. Judging from the experience of other states it seems best that the greater amount of effort be placed on the conservation of native species rather than on the introduction of foreign ones which are apt to supplant valuable native species, become pests, or introduce some infectious disease. A detailed report on the activities of the Game Farm can be found on pages 120–126.

Fish Culture.

In order that hatchery operations might be better administered the office of the Department of Fish Culture was moved from Sisson Hatchery to San Francisco in the fall of 1915. W. H. Shebley was placed in full charge of the department and E. W. Hunt was appointed Field Agent with the detail work of the hatchery and the car messenger service under his supervision. G. H. Lambson, of the United States Bureau of Fisheries, formerly superintendent of Baird Hatchery, qualified through civil service as superintendent of the Sisson Hatchery. These changes have greatly facilitated the work of this department.

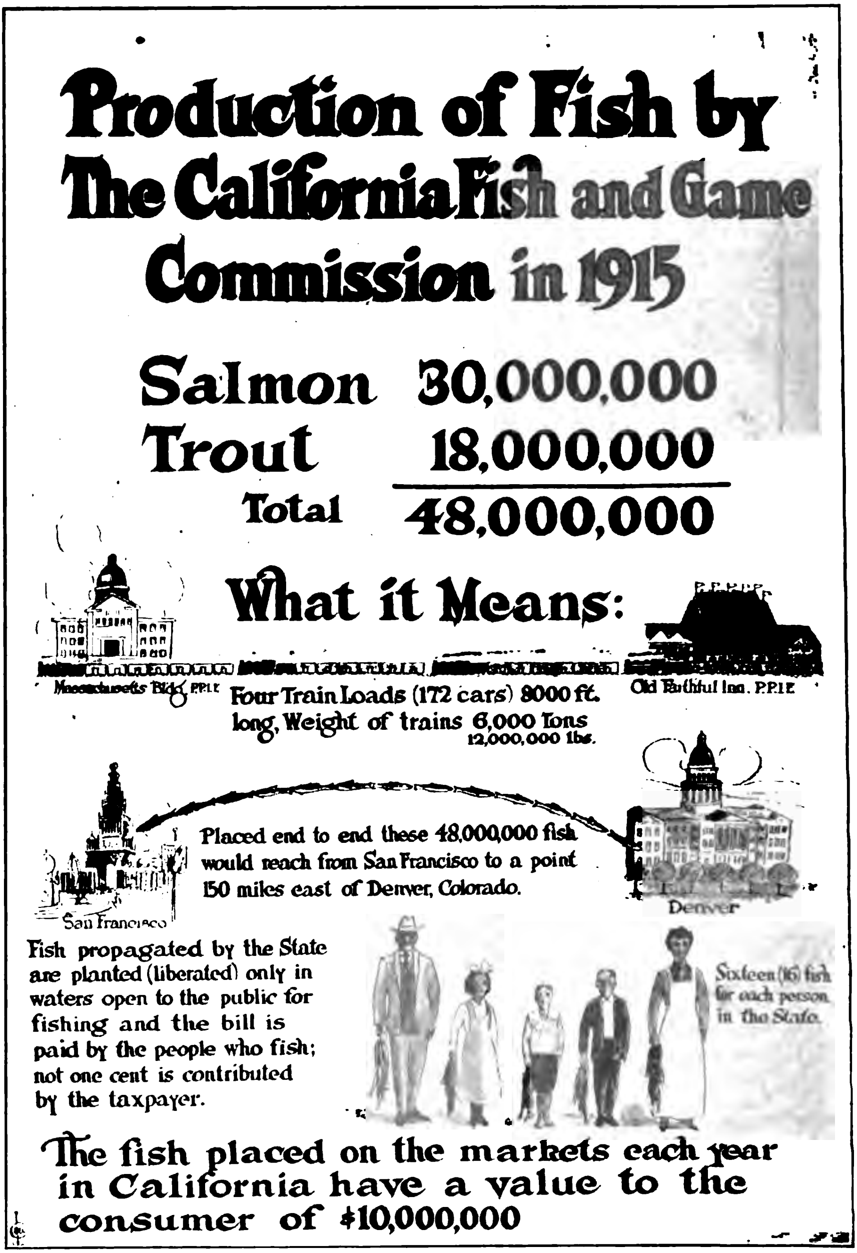
The hatcheries of the state have propagated a larger number of fish in this than in any previous biennial period. During the season of 1915 alone, 48,000,000 fish were planted in the streams of California, a number sufficient to furnish every resident of the state with sixteen fish (see Fig. 16). Eight hatcheries and six egg collection stations have been operated to their full capacity and the present stations will have to be enlarged and new ones installed in order to meet the increasing demand for trout fry. An additional hatchery building has been erected at the Sisson station, making five buildings in all. With this added equipment it is possible to hold the fry until they attain a better growth and hence are better able to withstand the changed conditions incident to planting.

As in past years, the salmon eggs procured from the United States Bureau of Fisheries have been hatched at this station and the fry carefully reared and fed until they were two or three months old, at which time they were distributed in the Sacramento River and tributary streams near Sisson, and in the Klamath River. In addition, a large number of fry have been held in ponds until they were eight months old. They were then distributed in the Klamath and Sacramento rivers early in the fall. Experience has shown that the best results in salmon culture are to be obtained by rearing several million fry on the upper reaches of the Sacramento River where the water is pure and cold and where the fry can be liberated in the headwaters of the Sacramento out of reach of the predatory fishes which infest the river lower down.

Fig. 15. A view of Mt. Shasta, at the southwestern base of which is situated the Sisson Station, the largest hatchery in the state. The snows on this mountain help furnish a pure cold water supply for the hatchery.

So large a number of trout fry were reared at the Sisson station that two cars had to be employed in the distribution of these fish. A baggage car was rented from the Southern Pacific Company and equipped with a gasoline engine and aerating system (see Figs. 20 and 21).

It has been found that the retaining of a stock of brood fish in the ponds gives a dependable supply of eggs each year. The take of eggs in the rivers, on the other hand, is variable. The pond system is therefore being improved. There were on hand in the ponds at the Sisson Hatchery on July 1, 1916, over 300,000 brood fish.



Production of Fish by The California Fish and Game Commission in 1915

Salmon 30,000,000
Trout 18,000,000
Total 48,000,000

What it Means:

Four Train Loads (172 cars) 8000 ft. long, Weight of trains 6,000 Tons 12,000,000 lbs.

Placed end to end these 48,000,000 fish would reach from San Francisco to a point 150 miles east of Denver, Colorado.

Fish propagated by the State are planted (liberated) only in waters open to the public for fishing and the bill is paid by the people who fish; not one cent is contributed by the taxpayer.

Sixteen (16) fish for each person in the State.

The fish placed on the markets each year in California have a value to the consumer of $10,000,000

Fig. 16. Fish distributed in 1915.

The Tahoe hatcheries have been operated to their full capacity during the last two seasons. It is planned to acquire a new site for the Tallac Hatchery where fry can be held until later in the fall. Fry if reared to a large size stand a better chance of survival after being planted in the Lake. The Department of Fish Culture is planning to make increased efforts to propagate lake trout (*Salmo tahoensis*). This valuable fish should be increased in number by artificial propagation. New varieties of game trout should be added to the native species now found in Lake Tahoe.

Brookdale Hatchery was operated during the season of 1915–1916 under a lease procured from Santa Cruz County. As a return for the use of the hatchery Santa Cruz County annually received 500,000 steelhead trout fry to be distributed entirely in the public waters of that county. Over 3,000,000 fish were reared at this hatchery in 1915 and over 1,500,000 in 1916.

The Ukiah and Fort Seward hatcheries reared both steelhead and rainbow trout. At the Fort Seward station 140,000 black-spotted trout, obtained from Lake Almanor, were reared and distributed in the Mad and Eel rivers. The situation of this hatchery is such that it can also be used for salmon culture. Next year an attempt will be made to obtain a supply of eggs from the Eel River.

The Bear Valley Hatchery, established by San Bernardino County, has been operated by the commission during the past two years. All of the fry reared were planted in Big Bear Lake and nearby streams of San Bernardino County. Adverse conditions hindered operations in 1916 and the output was therefore below normal.

The new temporary hatchery installed at Lake Almanor Dam, in Plumas County, had a successful season in 1916. At this station 1,635,000 rainbow trout eggs were collected and held until ready for shipment. Plans are being made for an additional egg taking station at Domingo Springs, one mile from Rice Creek Falls. This egg collecting station will help furnish a supply to the Almanor Hatchery.

The egg collecting station established on Hat Creek in 1915 had to be abandoned because of the tremendous flood of mud sent down the Hat Creek Valley as a result of the eruption of Mount Lassen. Not only were operations necessarily suspended, but all the fish in the stream, from its source to its confluence with the Pit River, were destroyed. This was one of the most serious destructions of fish life in recent years in California.

A location for a Southern California hatchery has finally been selected and what will be the most up-to-date hatchery in the world is now being built on Oak Creek, in Inyo County. The hatchery building, 192½ feet by 45 feet, is being constructed of natural stone, gabro and granite taken from the floor of the valley nearby and will cost approximately $60,000. The lower floor will contain, in addition to the hatchery room, offices, storerooms and a laboratory, and the second floor will furnish quarters for the help. The most up-to-date plumbing will be used. The location of this hatchery is unique, with snow-capped Mt. Whitney, the highest peak in the United States, in the background and Death Valley, 427 feet below sea level, seventy miles to the southeast—the roof and the cellar of the United States. The situation on Oak Creek will furnish an abundance of pure, cold water and eggs for the hatchery will be obtained at the Rae Lakes in the Sierras, at an elevation of 10,500 feet, reached by crossing a pass 13,000 feet in elevation. The rising generation may be able to point to this hatchery as the finest and most beautiful one in the world. This new hatchery will be able to supply fish to all points in southern California and as far north as Merced and the Yosemite Valley.

THE OLD AND THE NEW.

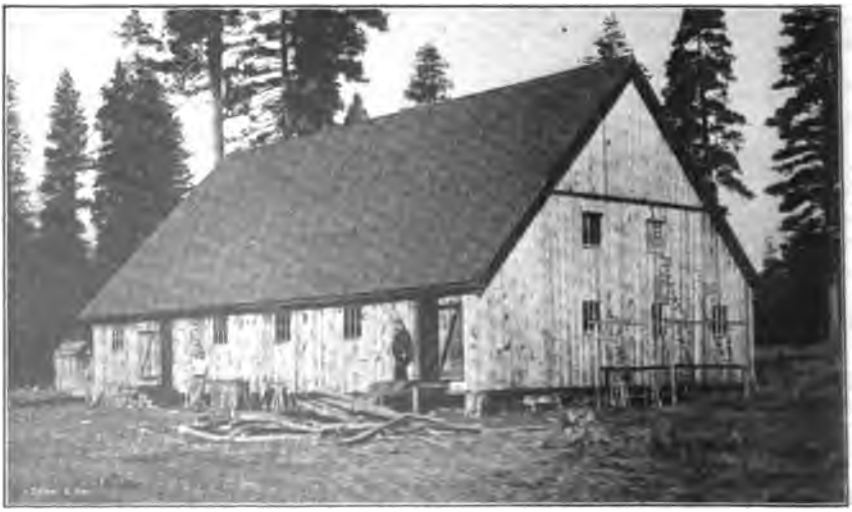
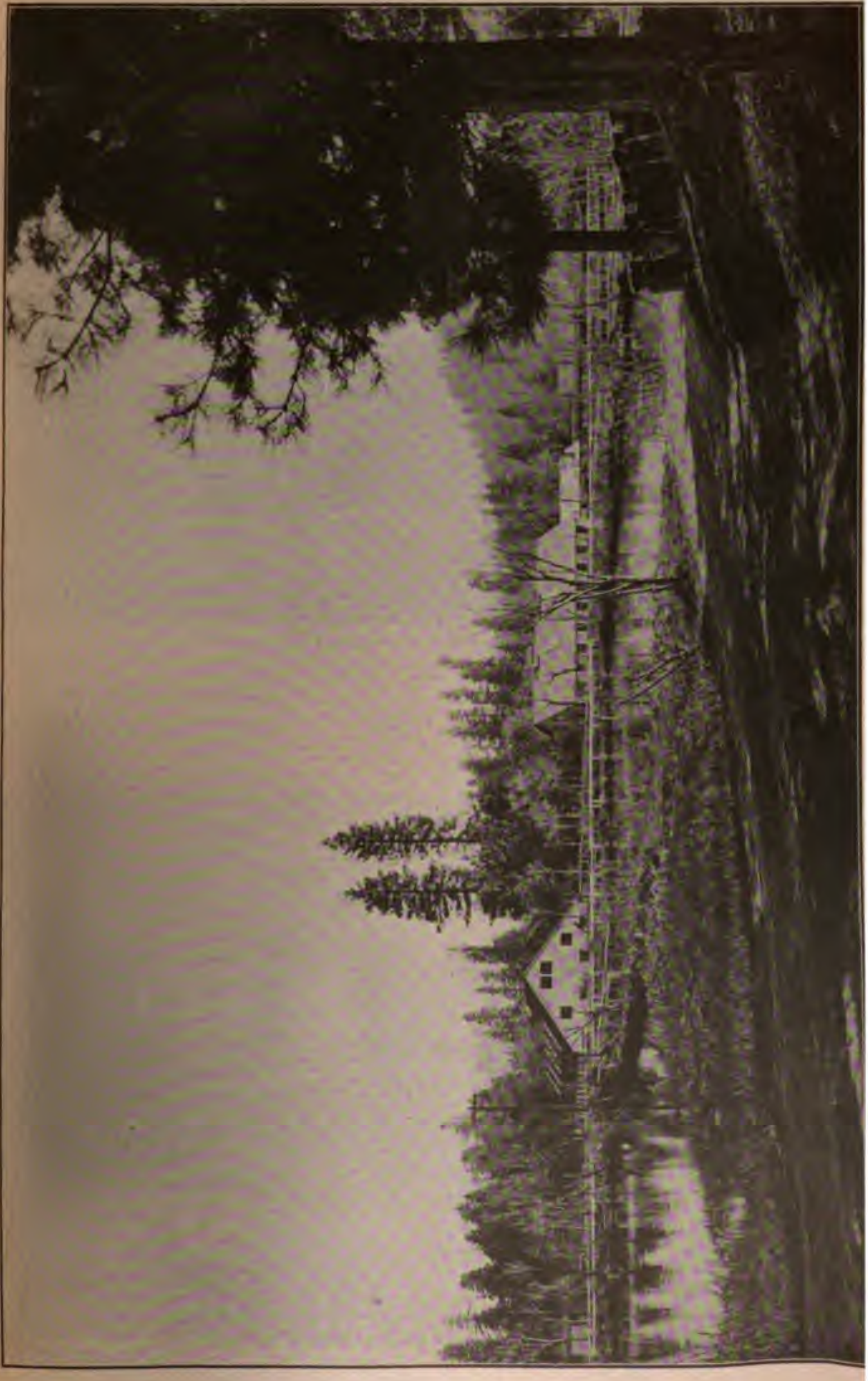


Fig. 17. The Sisson Hatchery in 1894.



THE OLD AND THE NEW.

FROM HATCHERY TO STREAM.

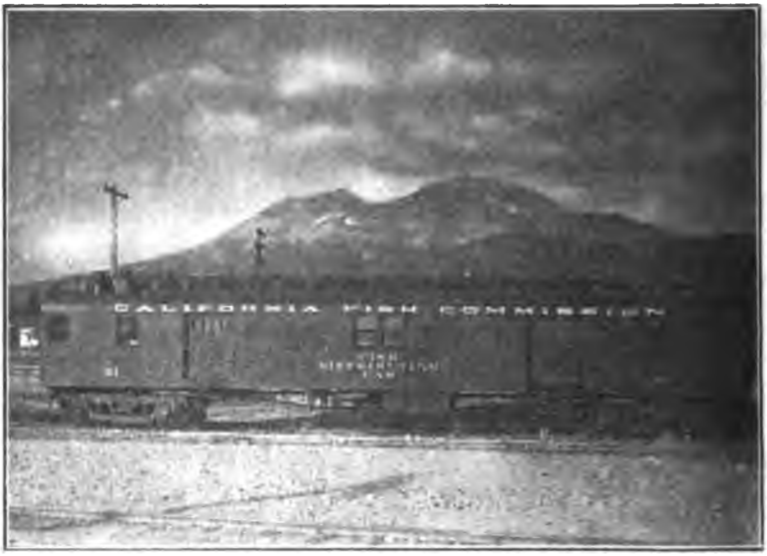


Fig. 19. Fish car No. 1.

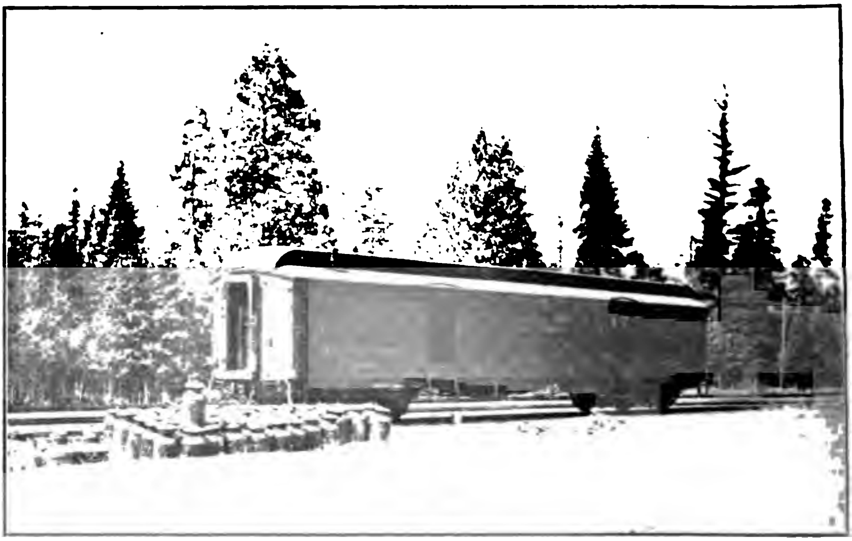


Fig. 20. Fish car No. 2 on the siding at Sisson.

FROM HATCHERY TO STREAM.

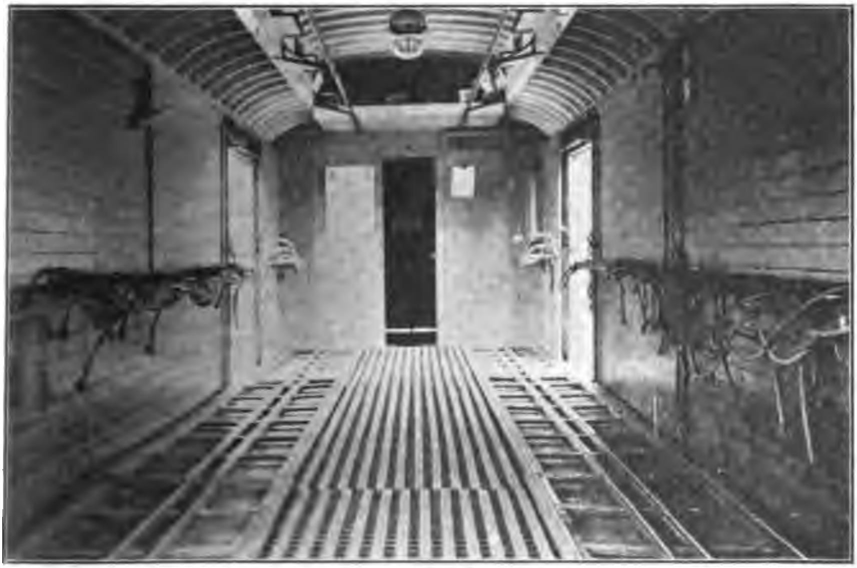


Fig. 21. Interior of fish car No. 2, showing aerating apparatus.

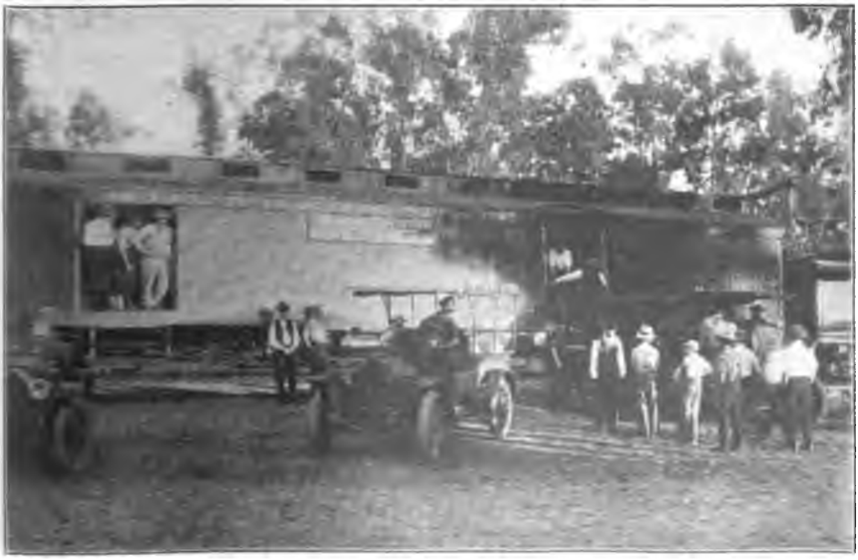


Fig. 22. Receiving fish from fish car preparatory to planting. Photograph by McCurry Company.

FROM HATCHERY TO STREAM.

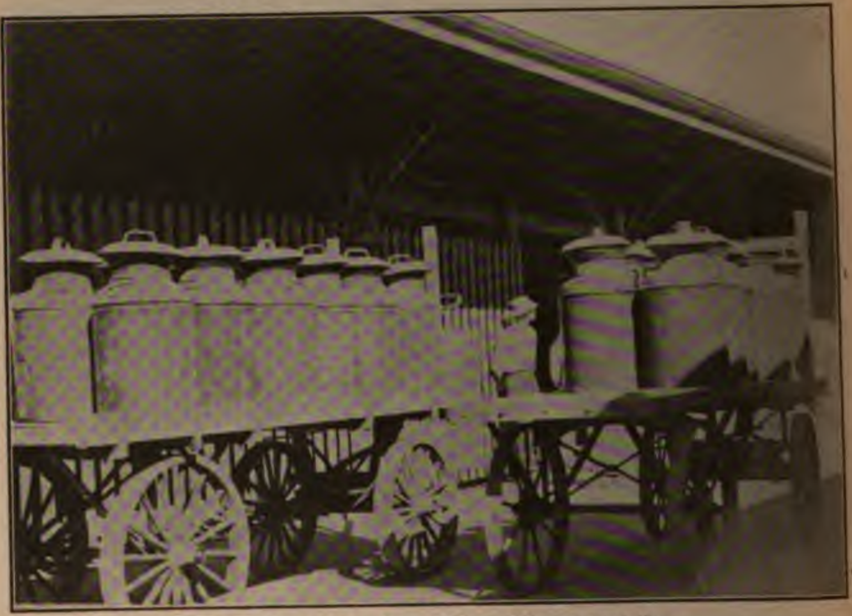


Fig. 23. Trout being removed from fish car at station.

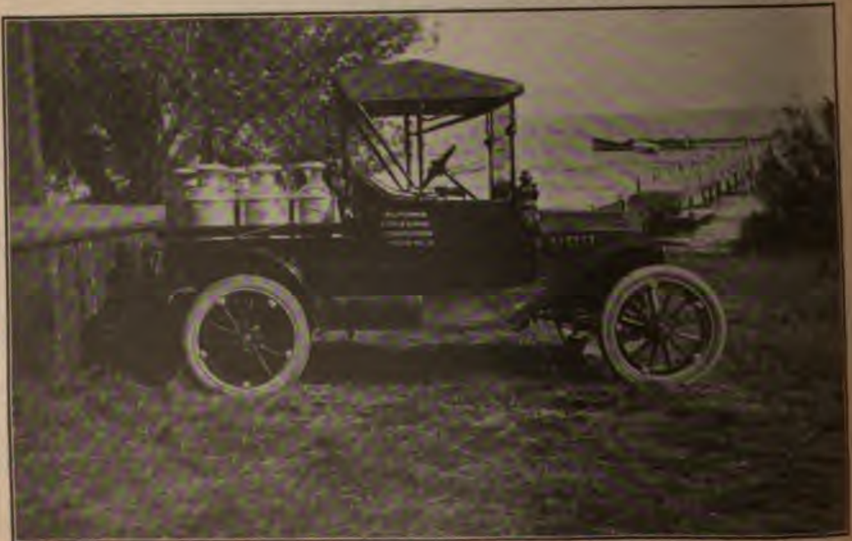


Fig. 24. Truck No. 3, one of the automobiles used in fish planting operations at Lake Tahoe

FROM HATCHERY TO STREAM.

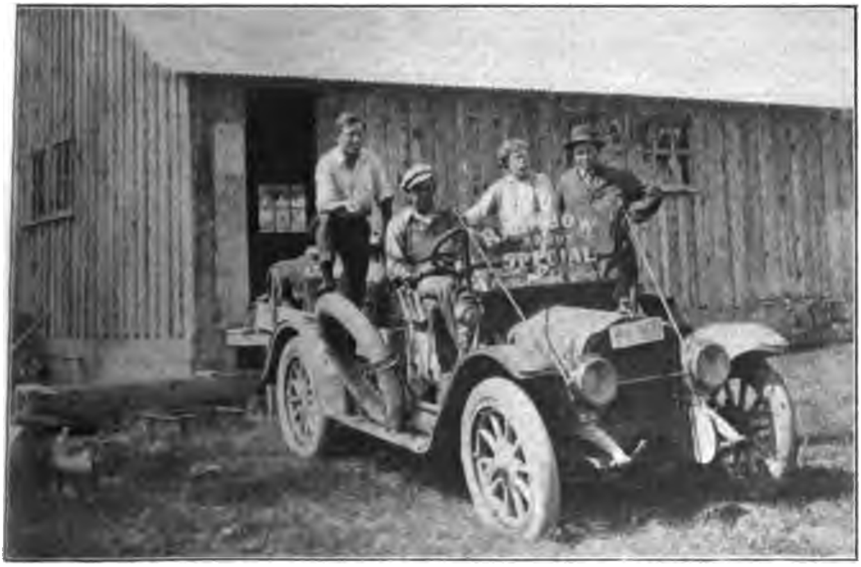


Fig. 25. Fish planting by automobile in San Bernardino County. The Bear Valley Hatchery in the background.

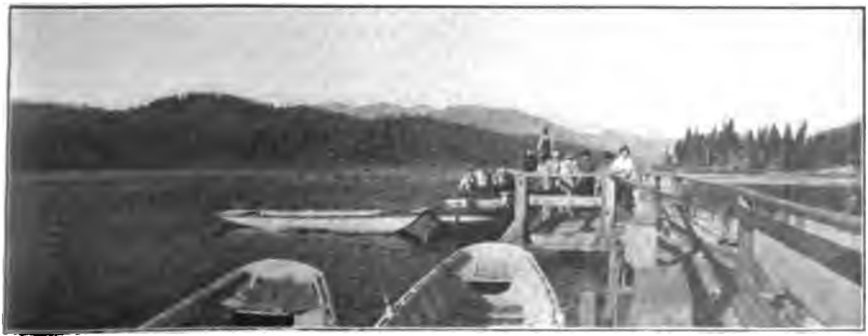


Fig. 26. Transportation of fish by boat preparatory to planting in Huntington Lake, Fresno County. Photograph by A. D. Ferguson.

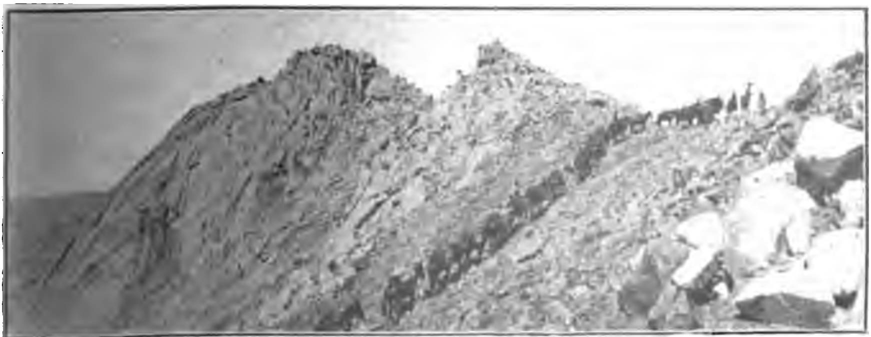


Fig. 27. Transportation by means of pack-train in the high Sierras. By using this means of transportation it is possible to plant many streams otherwise inaccessible. Photograph by A. D. Ferguson.

FROM HATCHERY TO STREAM.

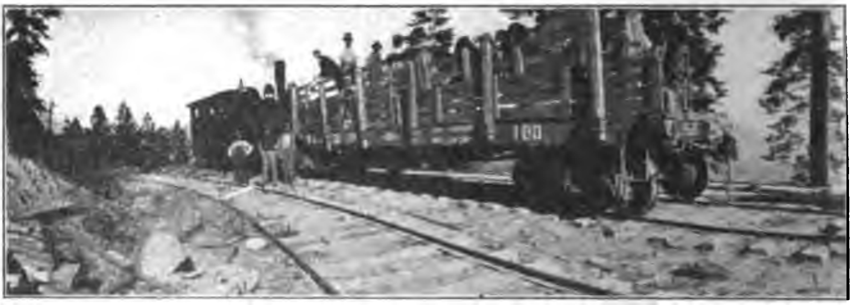


Fig. 28. Trout being transported to high mountain streams by means of a logging train. Photograph by A. D. Ferguson.

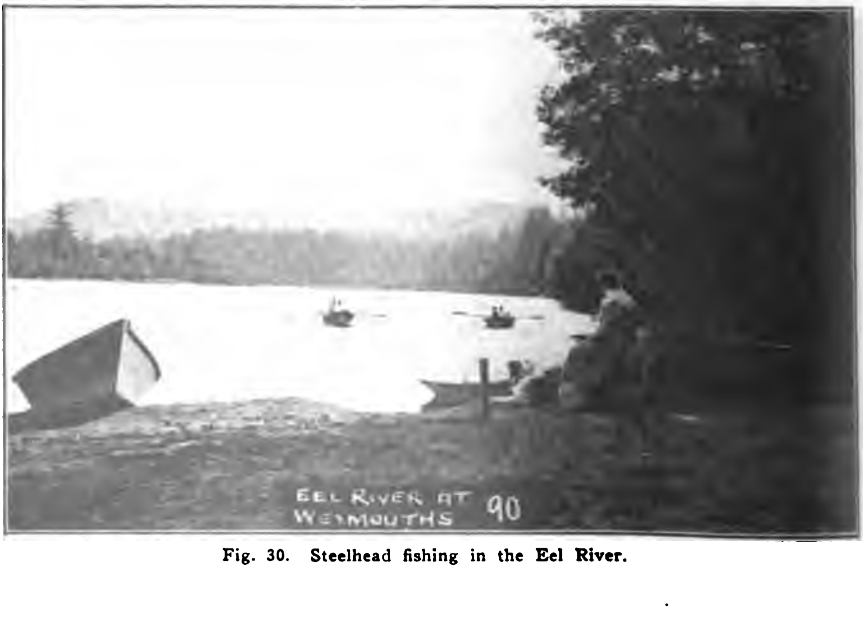


Fig. 30. Steelhead fishing in the Eel River.

FROM HATCHERY TO STREAM.

The falling off in the supply of shad in the Sacramento and San Joaquin rivers has necessitated investigations leading towards the institution of shad propagation. Shad were originally introduced into California by the Fish Commission in 1871. The fish for stocking were procured from eastern states. Within a few years shad became very abundant and they have continued so until recently. On the other hand, shad in the eastern states from which they were obtained have greatly decreased in numbers and requests have been received from the Massachusetts and Connecticut commissions for shad eggs for use in their hatcheries. In order to determine whether shad culture is feasible in California an experimental station was erected on the Sacramento River at Yuba City. Experiments proved that shad eggs can be successfully hatched and the fry kept free from bacteria and fungus. It is planned to hatch several million shad and striped bass this coming year. For further details of the fish cultural work see pages 54–79.

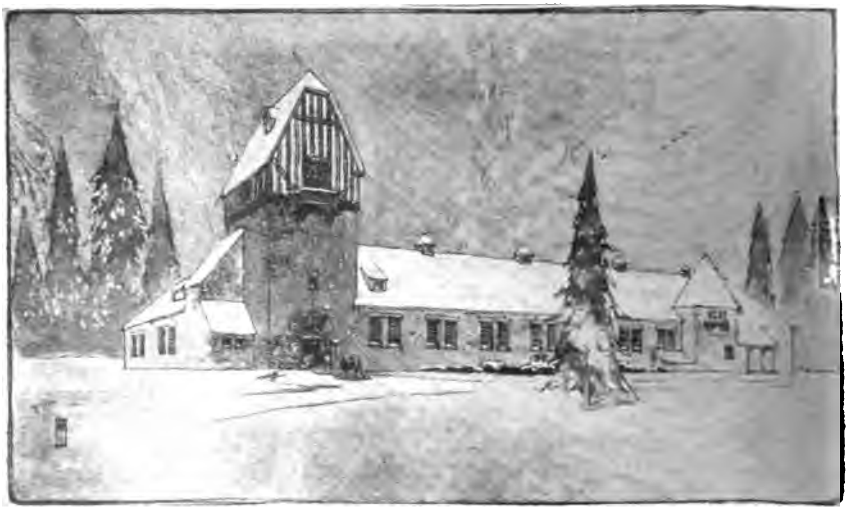


Fig. 31. Architectural drawing of the new Inyo Hatchery, situated on Oak Creek, Inyo County. This hatchery, located near the state highway, will, when completed, be the most modern hatchery in the United States.

Although the supply of fish in our streams does not appear to be decreasing, yet new conditions may endanger the supply. The number of anglers is increasing each year. Furthermore, each angler is increasing his annual catch. Streams which were formerly inaccessible are now reached with ease by means of automobiles. Consequently, greater and greater demands are made upon our hatcheries. To meet this demand new stations must be established and old ones enlarged. It also may be that some limitation upon the number of fishing days per week or the making of a shorter open season will alone counteract the effect of the ever increasing catch.

If there were no other justification for the existence of the Fish and Game Commission it could well rely upon the results of its attempt to stock the streams of the state with fish. Hundreds of lakes and streams formerly barren of fish life now contain millions of fish and these fish furnish food and recreation for all who will cast a fly or drop a line. Trout are now to be found in nearly every living stream easily accessible to the angler. Furthermore, there have been introduced into the waters of the state a number of food and game fishes not formerly found here. Black bass, striped bass, shad and several other species now add greatly to our fishery resources. Due to the activities of the commission the state of California offers as fine fishing as can be found anywhere, for there are far more fish in the lakes and streams than there were when the white man first came to the state.

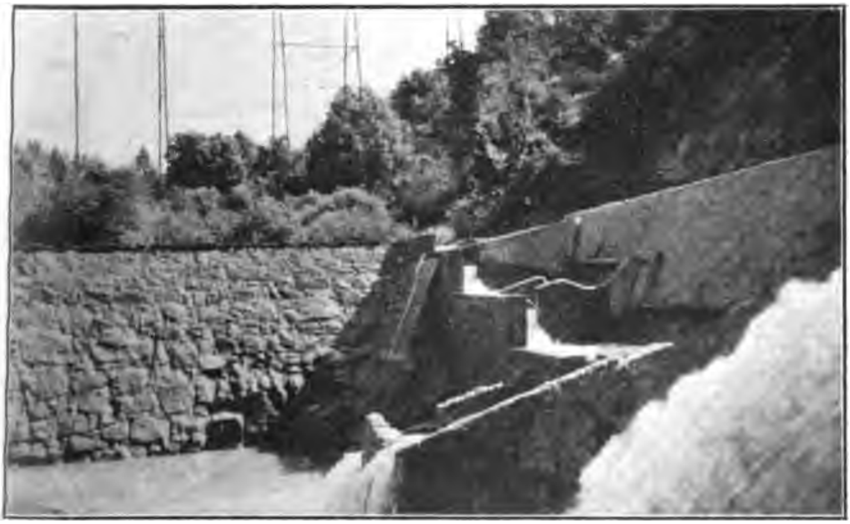


Fig. 32. Fishway built by Pacific Gas and Electric Company on Bear River, Placer County. Photograph by A. E. Culver.

Fishways and Screens.

Considerable progress in the installation of fishways and screens has been made. Eighty-six suitable fishways have been constructed at many places where fish have been unable to ascend streams because of dams or some natural obstruction, and ninety-two other sites have been surveyed. By the removal of large boulders and other natural obstructions the breeding grounds of fish have been greatly extended. In one instance more than 100 miles of spawning grounds were added by the removal of such an obstruction.

Experience has shown that the largest canals can be screened and the flow of water be undiminished. Even the work of cleaning has been reduced to a minimum. Large revolving screens which work in sections can be quickly cleaned by turning a crank, thus saving the labor attached to the cleaning of a parallel-bar screen. The cost of a 50-foot screen of this type is approximately $2,200. With the exception of the San Joaquin Valley, where some of the large canal owners are resisting the order to install screens, we have met with willing cooperation. Nearly 600 surveys have been made and 377 screens have been installed.

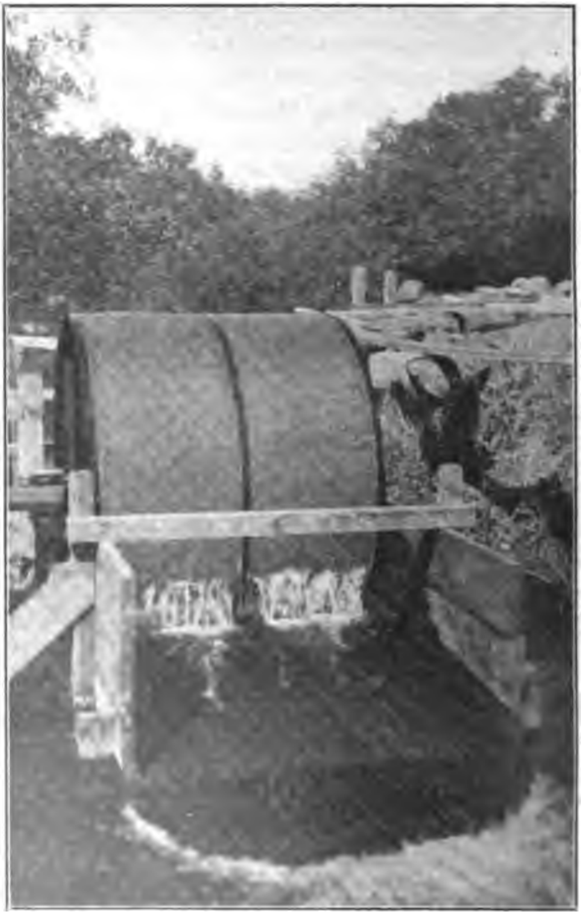


Fig. 33. Screen installed in an irrigating ditch near Edgewood, Siskiyou County. Fish are prevented from entering this ditch, but the flow of water is unhampered. Photograph by A. E. Culver.

Commercial Fisheries.

The rapid growth of our fisheries has necessitated more detailed and accurate knowledge in order that our fishery resources may be intelligently conserved. The Department of Commercial Fisheries, established in 1914, has been making careful study of the coast fisheries and has been gathering data which will be valuable as a basis for future legislation. A law enacted by the last legislature requires dealers and handlers of fish to make accurate monthly statements of the quantities and varieties of fish handled. These reports are being systematically compiled and the statistics regarding fishery products are being published in CALIFORNIA FISH AND GAME. Study has been made also of fish marketing and the department is at present cooperating with the State Market Director in attempting to unite the producer, the dealer and the people for their mutual benefit, and in fixing the maximum price the consumer should pay for fish. Largely due to the fact that accurate data was supplied the Market Director by this department of the Fish and Game Commission, splendid results have been obtained.

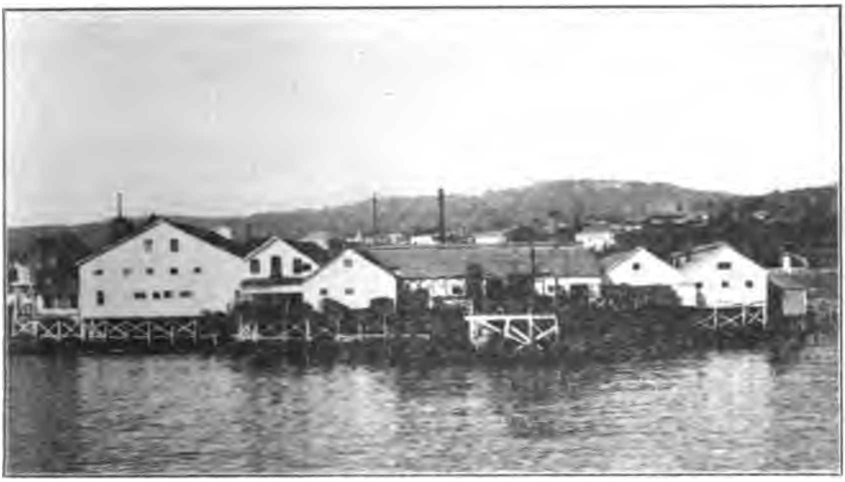


Fig. 34. Monterey Packing Company's plant at Monterey. Here large quantities of salmon are canned and mild-cured, and sardines canned. Photograph by H. B. Nidever.

A large number of marked salmon fry were liberated in the Sacramento River, Scott's Creek and San Lorenzo River in 1911 and 1912. A considerable number of these fish which have returned to the same streams have been obtained and data as to the age at which salmon seek fresh water, which is of much importance, is accumulating. Further experiments of this kind have been instituted.

Several important developments in California fisheries have necessitated careful study in order that control measures might be instituted. Of particular import is the growth of the long-finned tuna or albacore industry. The output of canned tuna now is more than double the value of the output of salmon or sardines. The tuna packers themselves are anxious to know more about the migration and life history of the albacore. Fortunately the United States Bureau of Fisheries has begun an investigation, but there is still much to be done.

Shad in the Sacramento and San Joaquin rivers have been decreasing during the past few years, due to overfishing. The total catch for 1915 was 3,816,048 pounds. Thirty-three carloads of fresh shad were shipped east. If this amount of fishing continues protective measures will be necessary to prevent serious injury to this fish. Already dangerous conditions are to be found. A record made in 1914 of the proportion of male to female shad on the upper San Joaquin River showed that the males outnumbered the females twenty to one. The sexes are normally about even. If an emergency measure could have been passed by the Fish and Game Commission the situation could have been promptly dealt with. This not being possible, no measures can be instituted until the meeting of the next legislature.

Fig. 35. Temporary camp of crawfishermen on San Clemente Island, showing new crawfish traps on shore ready for use. Photograph by H. B. Nidever.

The annual catch of California halibut exceeds 5,000,000 pounds. Although this fish is better protected than ever before, owing to the fact that dragnetting has been prohibited and the present law prescribes an eight-inch minimum mesh, it may be necessary to still further increase the mesh limit and a further conservation measure might be the closing of small areas to fishing.

Stringent laws now prevent the drying of shrimps, and the former destruction of young fish is prevented by confining shrimp fishing to South San Francisco Bay. At present only a few boats fish intermittently and the catch totals only about 350,000 pounds per year. Profit in the past has rested principally in dried shrimps since the price obtained for fresh ones—six and seven cents per pound—does not cover the higher operating cost.

Increased demand for potash which formerly was imported from Germany has led to the establishment of a new industry. The immense beds of kelp found along the California coast are now being cut and the kelp converted into potash. Four companies are operating at San Diego, five at Long Beach and one at Wilmington. Several new factories are under construction. It is believed that this industry will not have a serious effect on any of our fisheries. Many have feared that cutting of kelp would destroy the breeding grounds of the barracuda and the spiny lobster. Preliminary investigations do not support this view. There are other allied questions awaiting solution. For instance, it is important to know how the present operations may be regulated in order to assure a future supply. Already there is talk of county ordinances. Kelp and like products come under the jurisdiction of the Fish and Game Commission and regulatory legislation is being planned.

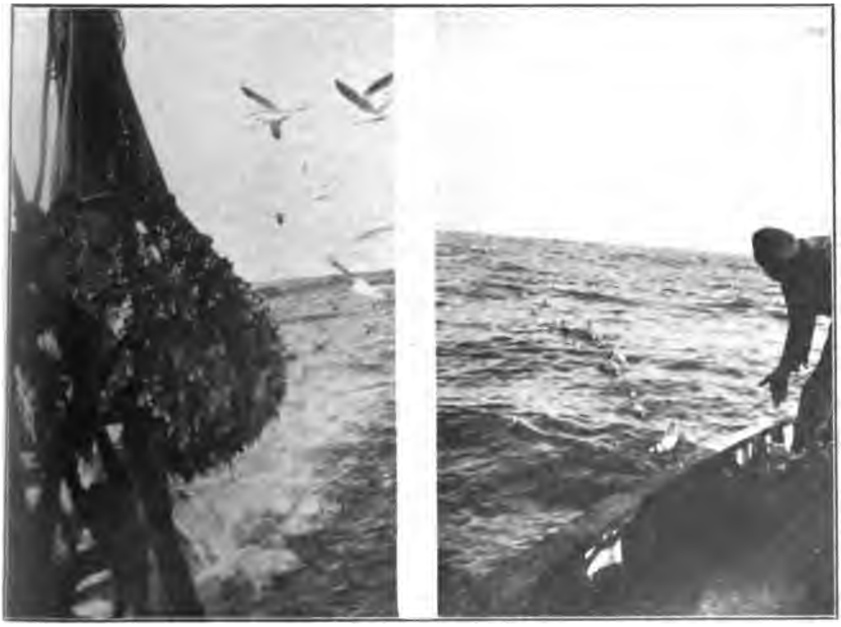


Fig. 36. Hauling 3-ton catch of fish aboard steam trawler off Point Reyes. Monterey fishermen hauling in rock cod off Point Sur. Note fish on line floating on surface. Photographs by H. B. Nidever.

Many of our sea fisheries have not been fully developed. The rapid growth of the sardine and albacore fisheries in the past few years is evidence of this. The albacore, formerly an unappreciated food fish, now takes rank as the most valuable of all. Were people made acquainted with several other species of fish other new fisheries might be developed. The shell fisheries of this state have been largely

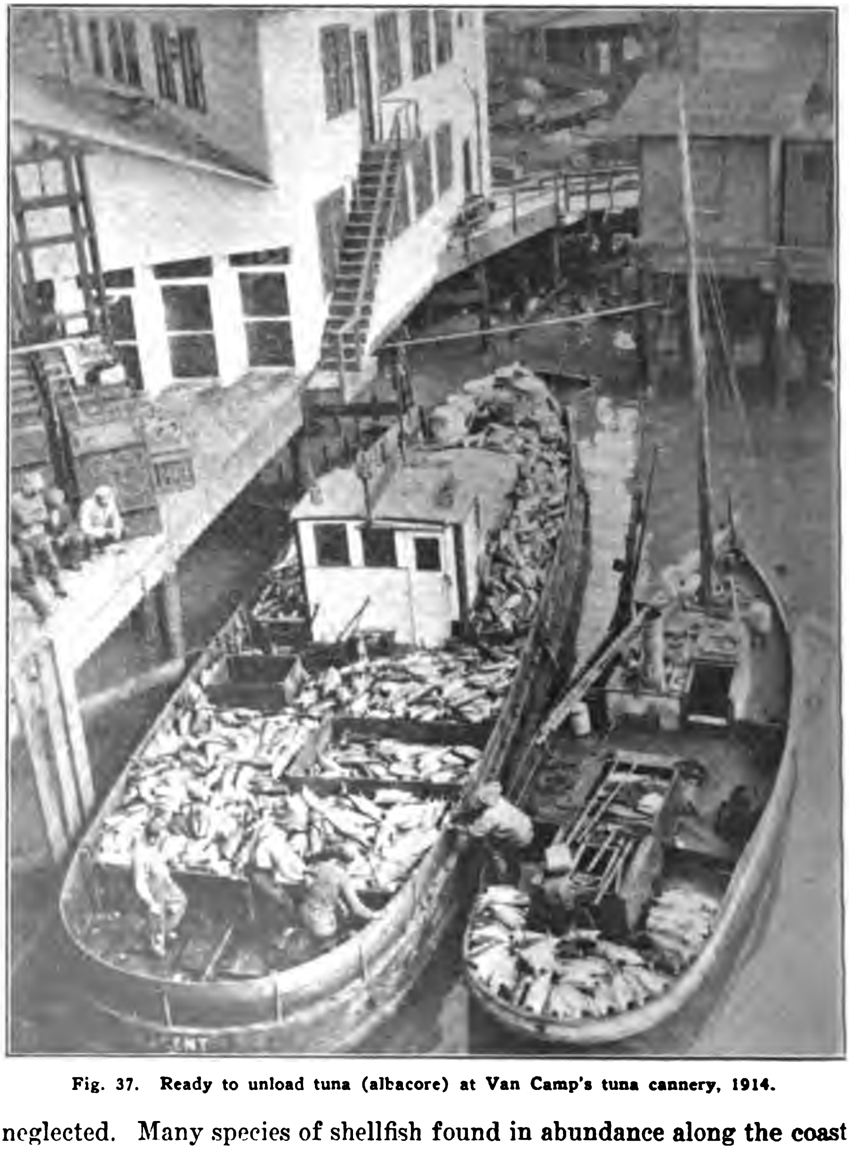


Fig. 37. Ready to unload tuna (albacore) at Van Camp's tuna cannery, 1914.

neglected. Many species of shellfish found in abundance along the coast would make excellent food were people educated as to their value. Furthermore, the soft-shell clam from the Atlantic coast could be profitably distributed here in bays where it does not now appear. There is also a future for oyster culture in California. To stimulate interest in these undeveloped fishery resources and aid in developing them is one feature of the work of the Department of Commercial Fisheries. For further details see pages 80–101.

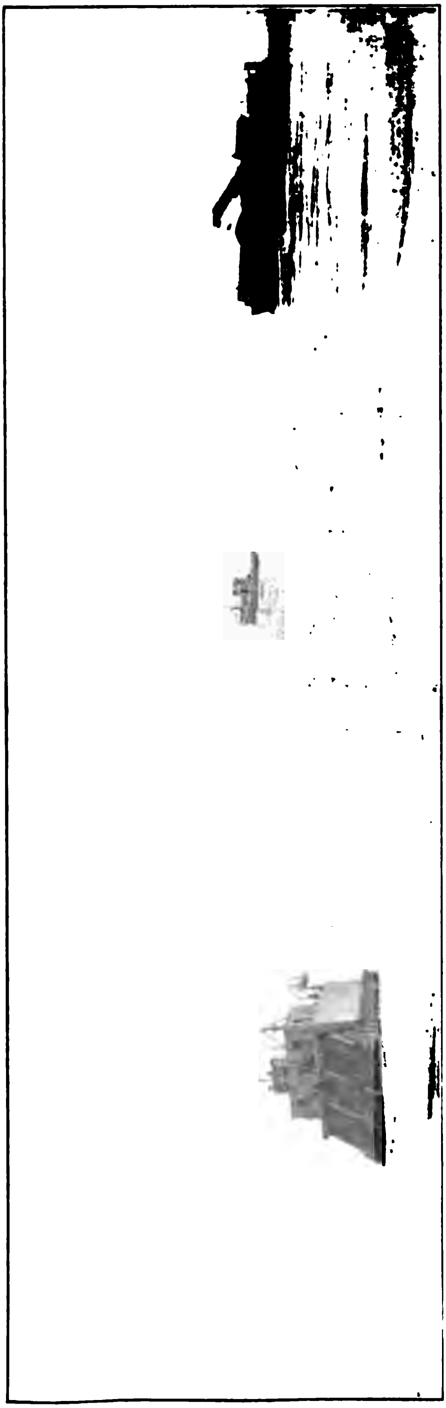


Fig. 38. Kelp cutter at work off Point Loma. Diamond Match Company's cutter and barge at work off Point Fermin. Photographs by H. B. Nidever.

Acknowledgments.

In the fulfillment of its duties the commission has had the help and cooperation of many different organizations. The United States Forest Service has greatly assisted in the administration of the fish and game laws and in the accumulation of data on the life histories of the different species of fish and game. The annual reports by chief forest deputies have been particularly valuable in furnishing information on the status of fish and game in the national forests. The Forest Service is in a position to render invaluable aid to the Fish and Game Commission by helping in the enforcement of fish and game laws, in the ridding of the forests of predatory animals, as well as in the propagation of fish. As an example, some twelve years ago, Supervisor Geo. W. Naylor of Inyo, then a forest ranger, carried fourteen rainbow trout over the almost impassable, bleak heights of the Sierras from the San Joaquin side, delivering safely in a camp bucket thirteen of them, which were put into Rae Lakes. These fish were the progenitors of one of the most wonderful rainbow trout centers known, which will furnish the eggs so badly needed to meet the enormous demands of the great southern California hatchery now being completed five and one-half hours below on Oak Creek. The University of California and Leland Stanford Junior University have continuously put at our disposal collections and laboratory equipment, have directed investigations and have helped to solve many puzzling questions. Acknowledgment is also made of the assistance of the United States Bureau of Fisheries, the United States Biological Survey, and of the fish and game commissions of other states, particularly that of Nevada, which has generously donated large numbers of brook trout. All of the railroad companies of the state have generously furnished free and reduced rate transportation of fish, attendants and special employees.

Statistical Reports.

Statistical reports of the several departments, including a record of fish-planting operations and a statement of the revenues and expenditures, are to be found in the appendix.

DEPARTMENTAL AND DISTRICT REPORTS

REPORT OF DEPARTMENT OF FISH CULTURE.

The Honorable Board of Fish and Game Commissioners.

GENTLEMEN: We have the honor to herewith present a report from the Fishcultural Department, for the years beginning July 1, 1914, and ending June 30, 1916—the third report since being placed in charge of fish culture.

Reports from all parts of the state indicate the beneficial results that have followed the systematic stocking of public waters under the supervision of men skilled in handling the fish. Notwithstanding the heavy drain on the streams and lakes by the ever increasing number of anglers, trout have appreciably increased in most of the streams where proper conditions have prevailed.

The ever increasing numbers of automobiles have carried the anglers on their journeys to all the accessible fishing waters in greater numbers each season. We find that a great many anglers who a few years ago, before the advent of the automobile, only fished one or two days in the season, now make frequent excursions to their favorite fishing grounds and take from the streams many times the number of fish that they did years ago. The increasing number of anglers, also the ease with which they can now reach the streams and the increasing zest for outdoor pleasures, such as angling, will soon make greater demands on our hatcheries, and to meet this demand some of our hatcheries will have to be enlarged and improved and new stations established. The Department of Hatcheries must meet the augmented demand for fish until such time when our annual limit of output has been reached, then a limit to the number of fish that each angler can take each season must be made by the legislature, either by limiting the number of days each week that persons can fish, or by making a shorter open season. With the contemplated improvements in our hatchery work, the time for this added legislation has not arrived and we hope it may be deferred for a number of years. California can safely say that, with only a few exceptions, fishing in most all of the streams is as good is it ever was; but with the extremely heavy fishing of the last two or three years we must keep close watch to see that our streams are not over-fished.

Administration Changes.

The commission decided during the fall of 1915 to have the office of the Department of Fishculture moved from Sisson Hatchery to San Francisco. This move necessitated a reorganization of the department. E. W. Hunt, who has been superintendent of the Tahoe hatcheries for twenty-five years, was made Field Agent of the Department of Fishculture, with the detail work of the hatcheries and the car messenger service under his supervision. A. E. Culver was placed in charge of screen surveys and A. E. Doney in charge of fishway surveys. As the superintendent of hatcheries had retained his appointment as superintendent of the Sisson Station since the date of his appointment as superintendent of hatcheries in November, 1911, a change in the superintendency of the Sisson Hatchery was necessary. A civil service examination was held in January, 1916, and G. H. Lambson, who had been with the Bureau of Fisheries as superintendent in the car messenger service and superintendent of Baird Hatchery, successfully passed it and was appointed by the commission as Superintendent of the Sisson Hatchery.

Stocking Lakes in the Inaccessible Mountain Regions of the State.

In the high Sierras and in the western part of Siskiyou and Trinity counties are hundreds of lakes of various sizes that are now barren of fish life. These can all be stocked at a small expense to the state and a greater area of fishing ground added to the state's wealth of waters in which game fishes will thrive.

Other improvements can be made by transplanting insects and other items of food from other waters to the streams and lakes that are lacking an abundance of proper food for trout. This work should be taken up at once and carried on systematically until all the streams and lakes that are deficient in proper food for the trout are in condition.

Fish Propagation.

Eight hatcheries and six egg collecting stations have been operated to their full capacity during the last two seasons and it will be necessary to enlarge our present stations and establish new ones to meet the demand for trout fry as well as to do the salmon work properly.

Our hatcheries should all be equipped with enough troughs and rearing tanks to rear the fry to a fair size before shipping. The relative advantages of planting fry or fingerlings in our streams and lakes is a question that is being brought up continually and in which there is a great difference in opinion. In our judgment both systems have their advantages, depending on the size of the stream, altitude, amount of natural food, variety of the fish and the season of the year. By studying these conditions and using good judgment and care in the distribution of either fry or fingerlings good results can be obtained.

The best results are obtained in planting fry in the smaller tributary streams in spring and summer when there is an abundance of food provided naturally to support fry at that age. In southern California, in the lower altitudes, conditions appear to be somewhat different and a larger fish planted in the fall seems to do the best; but in the mountainous parts of southern California, spring planting has given excellent results.

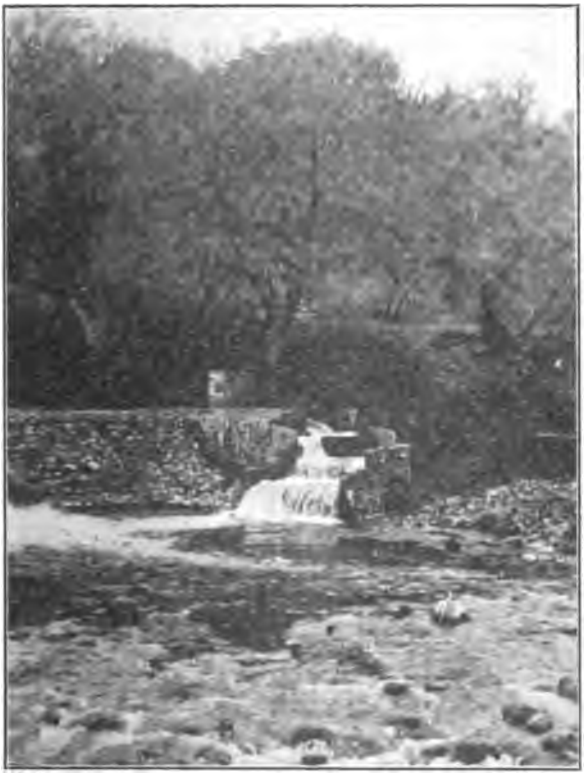


Fig. 39. Fish ladder constructed by Northern California Power Company on Butte Creek, Tehama County. Photograph by A. E. Culver.

The planting of fingerlings has an advantage over fry when the fish are planted in large streams or rivers where there are no spawning beds or natural feeding grounds for the fry, such as exist in the smaller streams. These places are not very numerous, as in most river systems suitable tributary streams can be found in which to deposit the fry, and as they develop they work slowly down the streams into the larger bodies of water, following their natural inclinations.

Some enthusiasts would have us rear the fish until they are almost large enough to catch, before planting. This would be beyond the finances of the commission to carry out, and furthermore a fish artificially fed too long is not a good rustler when liberated and is apt to suffer considerably before getting accustomed to natural conditions. Some of the best results have been obtained where fry from two to three months old have been planted. Absolute proof of this is at hand where new species have been introduced in the streams. Fry, if in perfect condition, free of bacterial disease, carefully reared by a skilled fishculturist and planted in the small tributary streams, are sure to give good results. We have been a close observer of these conditions for over thirty years in California and feel that we are pursuing the right policy in planting the majority of the fry from our hatcheries when they are from two to four months old.

A number of writers who are not fishculturists have advocated the building of ponds and nurseries along the banks of the different lakes and streams in the state to rear the fry until they are fingerlings before they are released into the streams. This might do in a few localities, but when we figure on rearing 16,000,000 or 18,000,000 of fry on thousands of miles of streams the proposition is impracticable, even if the state had money enough to build the ponds and to pay men to care for the fish. To turn the fry over to inexperienced persons, even where they go to the expense of building the ponds, is a poor policy and one in which the public as a rule will not benefit. The experience of fishculturists who are working for the public good must be considered in preference to enthusiasts and theorists. Fishculture is a well demonstrated practical proposition and the experience of men skilled in this work must be considered if the public is to get the benefit of the money invested.

Fishways and Screens.

The work of installing screens in the ditches and canals of this state and of constructing fishways over dams and obstructions has progressed entirely satisfactorily during the last two years. A. E. Culver as screen surveyor and A. E. Doney, fishway surveyor, have been untiring in their efforts to enforce the law and conserve the fish.

One hundred seventy-eight surveys of ladders over dams have been made. As a result of these surveys eighty-six obstructions have been removed or fishways installed in order that fish might have a free passageway.

Nearly six hundred screens have been ordered installed and 377 have been reported as completed. The wide extent of operations is indicated by the fact that screen surveys have been made in thirty-five different counties during the last two years.

Some new and difficult problems have presented themselves in both the screen and fishway work, but good progress has been made over the entire state, with the exception of the San Joaquin Valley, where some of the large canal owners are resisting our efforts to install screens in their canals. These owners object on the grounds that the screens are impractical and will impede the flow of water. This is a flimsy excuse, as experience has proved that the largest canals can be screened and the flow of water be undiminished, if they are properly cleaned. The parallel bar screen can be made to do good work and not cause any trouble under normal conditions. During extremely high water when floods prevail in the streams caused by melting snow or storms in the mountains carrying down an excess of floating matter, the screens can be removed for a short time to allow the debris to pass. When conditions are normal the screens can be replaced. It would be folly to say that the large canals can not be screened. If we can not have them screened all the time, we should make an effort to save as many fish as possible by keeping the screens in place when it can be done without damage to the flow of water in the canals.

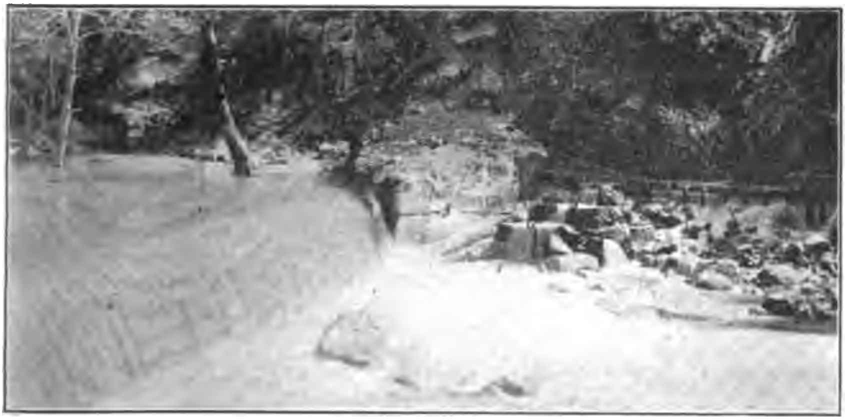


Fig. 40. Fishway at Bonally Dam, on the Salmon River, Siskiyou County. Photograph by I. Eldredge.

A screen is being installed in the Pacific Light and Power Company's canal at Borel in Kern County that works in sections on a revolving shaft. It can be cleaned at any time by turning a crank that turns the screen sections edgewise with the current and allows the debris to float down the stream. As soon as the debris is washed off, the screen is turned back in place. Some such device can be arranged if the parallel bar screens are considered too hard to clean. Any of the types of screens that we have recommended will work, if they are cleaned. We find that the trouble appears to be that some of the owners of the larger canals do not want to pay for the extra help required to clean the screens.

The commission plans to rigidly enforce the law regarding the screening of ditches and no excuses will be entertained. Taking it as a

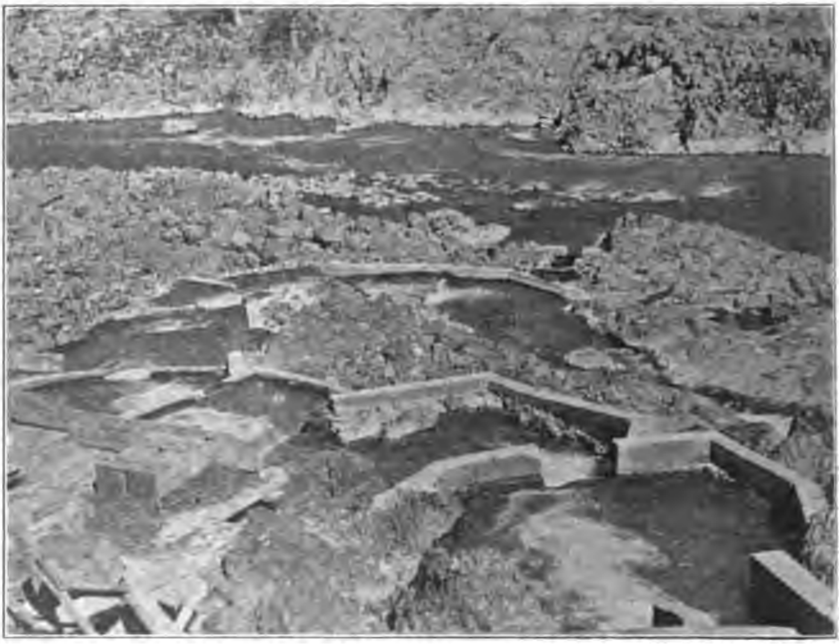


Fig. 41. Snow Mountain Dam Fishway, on south fork of Eel River, Mendocino County. Photograph by H. C. Bryant.

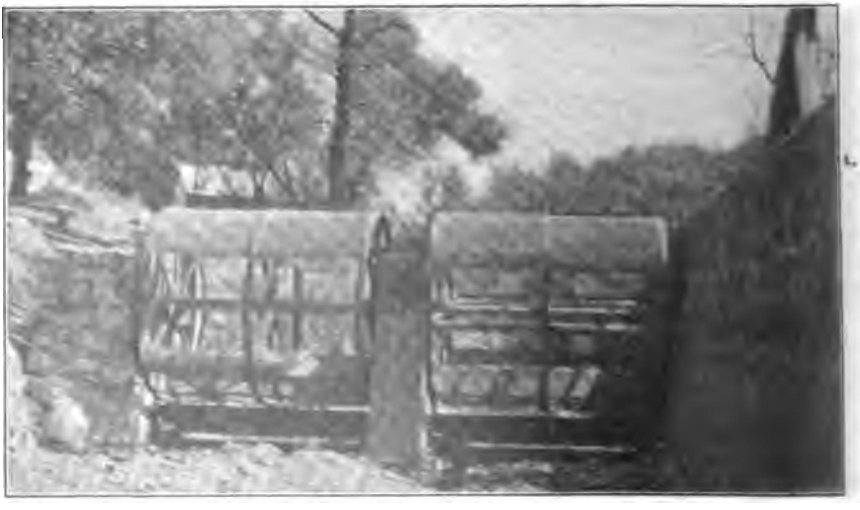


Fig. 42. Screen of Northern California Power Company at Inskips, Tehama County. Photograph by A. E. Culver.

whole, the screen work has been very successful, considering the number of ditches and canals that we have had to handle and the great difference in conditions that prevail in different parts of the state.

Pollution of Streams.

The pollution of the inland streams by sawdust, slimes from the mines, and other waste matter polluting the streams, has been given attention whenever reports have been received. We have not had any serious trouble with any of the cases handled, although numerous complaints regarding stream pollution by mining operations are received. Many reports come from the old mining districts where the fish were destroyed in the early history of mining operations in this state and no further damage can be done. Wherever new plants are reported we insist that all the slimes be impounded in storage reservoirs or vats until the heavier material has settled.

The flotation process of working ores has given us considerable trouble, as the pulp is so fine that it is very difficult to settle, remaining in suspension in the water for weeks. The damage that it does to the fish is very slight if the plants are not too large. We are giving this, one of the latest processes of handling ores, special study, for this method will probably be used extensively in nearly all mining operations in the future.

Propagation of Shad.

Early in the season of 1916 the question of propagating shad was taken up by the department. The heavy fishing for shad in the bays and in the Sacramento and San Joaquin rivers for the last few years had caused noticeable falling off in the numbers of these fish and to keep the supply up it was deemed necessary to resort to artificial propagation.

About the same time we received a request from the Massachusetts and Connecticut Fish and Game commissions requesting the California commission to collect shad eggs from California waters and ship them to their hatcheries, as they were desirous of restocking the depleted waters of the Eastern states with shad. Shad were introduced into California by the California Fish Commission in 1871. They increased rapidly until a few years ago the Sacramento and San Joaquin rivers were fairly alive with them in the spring and summer when the run of shad was at its height.

The excessive fishing and pollution of the Eastern rivers has caused the shad to become very scarce and it was the desire of the Massachusetts and Connecticut commissions to restock their waters. We agreed to collect the shad eggs for the two commissions, as it was considered an cpportune time to carry on experiments to locate the spawning places of shad as well as to make experiments to determine whether shad culture could be carried on successfully in California, and to determine whether the process of fertilizing the eggs and propagating the fry could be improved upon.

Consequently, the commission decided to operate a shad hatchery on a small scale during 1916 to carry out the experiments and to gather data in preparation for more extensive operations next season. When operations were begun in May, it was thought that all the eggs necessary for the shipments East, as well as for our experiments, could be collected by the latter part of May or early in June, but the season proved to be unfavorable and the work dragged along into July without sufficient eggs being obtained at one time to make a shipment East.

Fishing began on June 3d with our crews at Yuba City. The run was poor all through the season in the upper reaches of the rivers; nowhere near its size in former years. The light run of shad in the upper river was due to the very cold spring, cold water, and later to the high, roily water caused by the melting snow in the higher altitudes. During the season 1,421,000 shad eggs were collected and 872,000 fry hatched and successfully released in the Feather River. This work was under the immediate supervision of Superintendent G. H. Lambson of the Sisson Hatchery. Data regarding the movements of the shad that will be valuable in future shad work have been compiled as well as the results of the experiments in hatching the shad fry. The eggs were successfully hatched and the fry kept free from bacteria and fungus.

This coming season the shad work should be taken up in earnest and several million shad as well as striped bass should be hatched and distributed in the Sacramento River to keep up the supply of these valuable fish. Shorter seasons for catching these fish should be established by the legislature.

Sisson Hatchery.

Sisson Hatchery has been operated on the same general plan as in former years. The fry are held until they are from three to eight months old and are then shipped to all points in California where the local hatcheries can not supply the number and variety of fish desired.

As the result of a cooperative arrangement with the United States Bureau of Fisheries the commission received 34,300,000 quinnat and 1,900,000 silver salmon eggs in 1914–15 and 18,400,000 quinnat salmon eggs in 1915–16. These eggs were hatched and the fry carefully reared and fed until the majority of them were two to three months old; then they were distributed in the upper reaches of the Sacramento River and tributary streams near Sisson, and in the Klamath River. These fry were deposited in natural feeding grounds under conditions as nearly perfect as it was possible to find. Several million of the fry are held each season in the large ponds at Sisson Station, where they are carefully looked after and systematically fed until they are about eight months old; then they are distributed in the Klamath and Sacramento rivers early in the fall. A record of the numbers and place of distribution of these plants will be found in the statistical report of distribution from Sisson Hatchery.

During the fall of 1914, the commission decided to construct another hatchery building on the grounds of the Sisson Station to enable them to hold the fry so they could attain a better growth by giving them less crowding and more trough space. Accordingly, plans were made by the Department of Hatcheries, which the board approved. The plans called for a building 190 feet long and 42 feet wide, to contain 148 hatching troughs. As the expense of constructing this hatchery was over one thousand dollars, we had to have the work carried on under the supervision of the State Department of Engineering. This was to comply with a recently enacted law. To allow us to carry out our plans of constructing this building, W. F. McClure, State Engineer, kindly appointed the superintendent of hatcheries a deputy state engineer to construct the building. The work was rushed and the building completed in time to receive part of the salmon eggs from the Bureau of Fisheries' stations during the latter part of the hatch of salmon eggs for the season of 1914 (see Fig. 44).

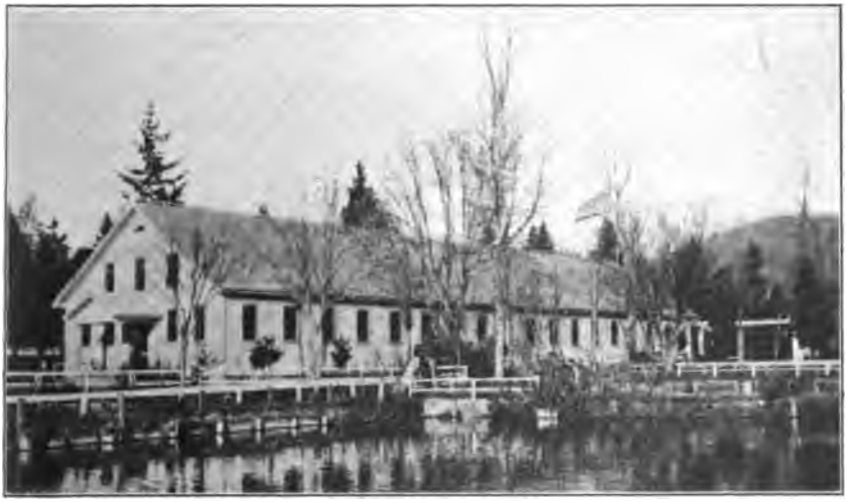


Fig. 43. Hatchery "A" at Sisson. Photograph by G. R. Field.

With its five hatchery buildings and auxiliary battery, containing in all over 500 troughs, and its 52 breeding ponds, the Sisson Station must be considered one of the largest hatcheries in the world. The station now has a capacity of fifty million trout and salmon fry per season.

One new pond was rented from Mr. Rupp, during the winter of 1915–16. The lease on the large pond, known as Sisson Lake, expired in the fall of 1915 and we were not able to have it renewed, so Mr. Rupp, who owns one of the large ponds leased by the commission for salmon culture, agreed to construct another pond and lease it to the commission for the rearing of fish. The pond was completed early last winter and stocked with salmon, where they are thriving. These fish will be distributed during the fall of 1916. We would respectfully recommend that the commission take measures to purchase these leased ponds or acquire more land near Sisson Hatchery to construct large ponds such as these, of one acre or more in area, for the rearing of salmon fry. The more experience we have in rearing salmon fry in ponds, the more we are convinced that the best results in salmon culture are to be obtained by rearing several million fry each season on the upper reaches of the Sacramento River where the water is pure and cold and where the fry can be liberated in the fall out of the reach of the predatory fishes that infest the Sacramento River after it enters the valley proper.

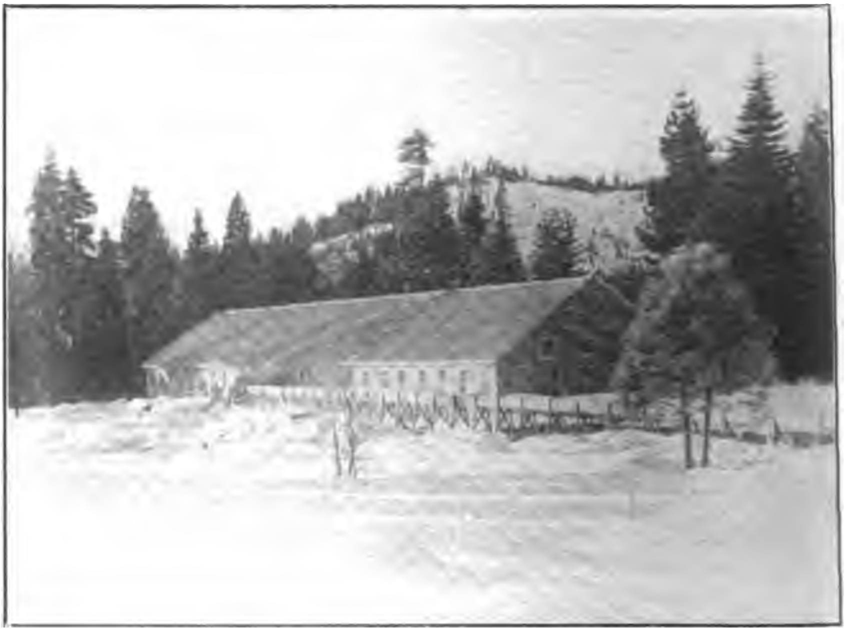


Fig. 44. Hatchery "E" at Sisson Station, completed January 1, 1915. This is the fifth large hatchery building erected at Sisson.

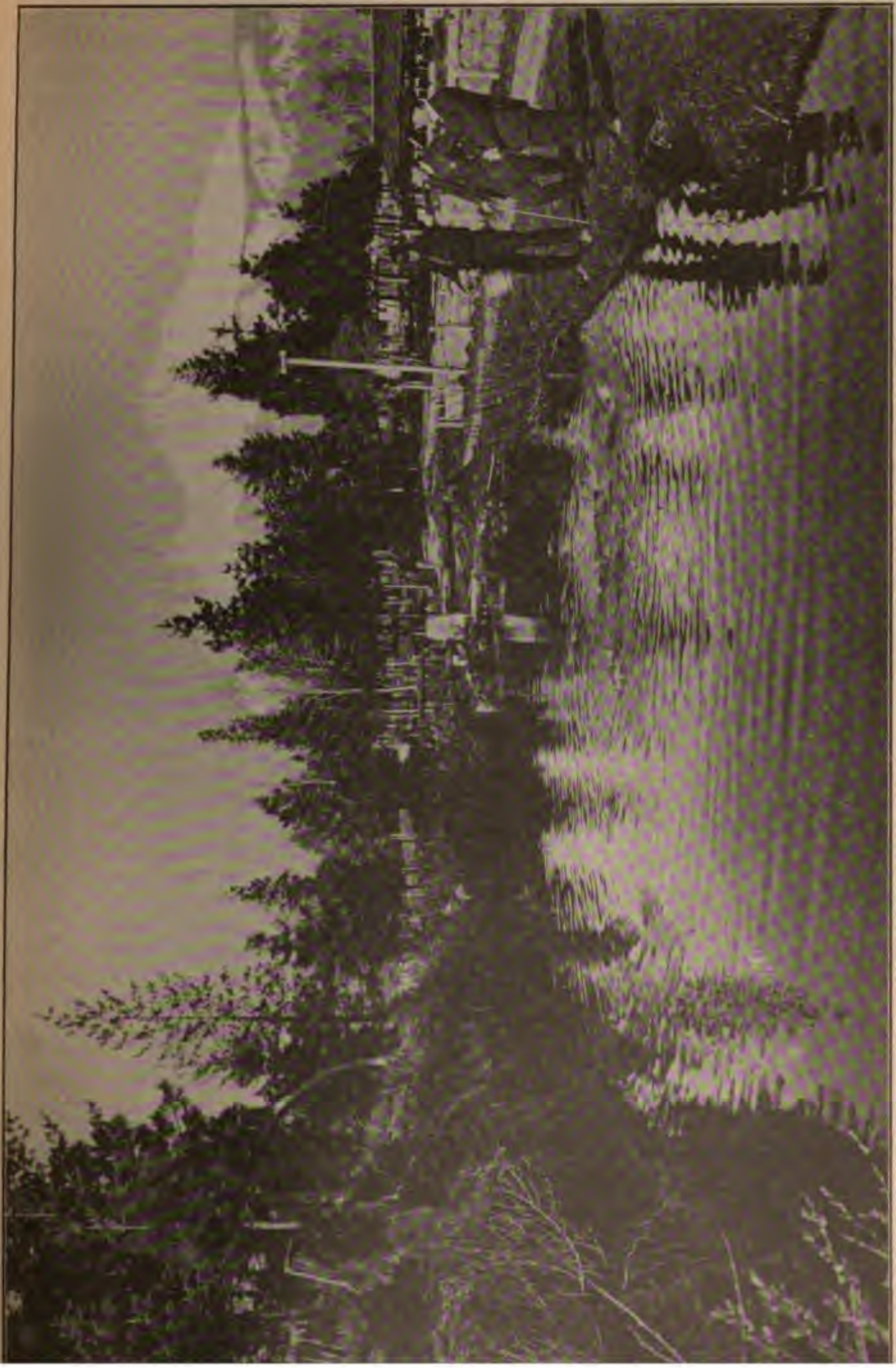


Fig. 45. Feeding fish in one of the ponds at Sisson Station. Photograph by Union Lithograph Company.

The increased number of trout fry hatched at Sisson Station during the season of 1915, 11,372,000, caused the Hatchery Department to design a more extensive plan of distribution. Accordingly, it was decided to operate two distribution cars. Arrangements were made with the Southern Pacific Company to rent a baggage car and have it equipped with a gasoline engine and an aerating system. This car was equipped at the Southern Pacific Company shops in Sacramento and put into the service July 1, 1915 (see Fig. 20). During the distribution season of 1916, two distribution cars were used from Sisson station.

The total number of fry distributed from Sisson Hatchery during the season of 1916 was 9,597,000, consisting of the following varieties: rainbow, eastern brook, Loch Leven, black-spotted, steelhead and German brown trout. There will be approximately 18,000,000 quinnat salmon distributed from Sisson Hatchery this season.

The pond system is being maintained and improved. We find that it is necessary to keep a good stock of brood fish in the ponds to give us a supply of eggs that we can always depend upon.

The number of fish on hand in the ponds at Sisson Hatchery July 1, 1916, was as follows:

	Adults	Two years old	One year old	Fry	Total
Trout—					
Rainbow	9,100	3,900	25,000	40,000	78,000
Eastern brook	8,600	10,000		60,000	78,600
Loch Leven	12,650	5,100	30,000	20,000	67,750
German brown				80,000	80,000
Steelhead			8,000		8,000
Dolly Varden	4				4
Miscellaneous—					
Landlocked salmon			450		450
Grayling	400				400
Total					313,204

Tahoe Hatcheries.

The Tahoe Hatcheries have been operated to their full capacity during the last two seasons. Mr. Hunt has had immediate supervision of these stations, as in former years. The output of fry will be shown in the statistical tables for these hatcheries.

We again respectfully recommend that the much needed improvements at Tahoe station be carried out in the near future. The Tahoe Hatchery should be enlarged so as to give it a larger trough capacity and Tallac Hatchery should be removed at the earliest possible date from Taylor Creek to Tallac Creek or to any other site where the water is suitable for rearing fish. The water in Taylor Creek is not fit for hatchery purposes. Taylor Creek rises in Fallen Leaf Lake and its water, during the warm weather, becomes impure from the organic matter in the lake. The fish become affected and it is necessary to plant them early in the season before they have made their proper growth. Negotiations are under way at present to acquire a new site on a nearby stream where the fry can be held until later in the fall, before distributing them. A battery of tanks is being planned in which to rear the fry to a much larger size than formerly, before planting them.

We repeat the recommendation made in the last biennial report regarding increased efforts to propagate the large lake trout (*Salmo tahoensis*), by trapping the upper Truckee River and Blackwood Creek for their eggs. This valuable fish should be increased in numbers by artificial propagation.

Fig. 46. Seining for striped bass to be transplanted to barren waters. Photographs by H. H. Hunt.

New varieties of game trout should be added to the native species of trout in Lake Tahoe, thus affording a fish for the angler as well as for the commercial fisherman. The Department of Fishculture is making arrangements to carry out these plans.

Considerable complaint has been made regarding the leeches affecting the trout in the streams entering into the lake, and the commission has been requested to remove the logs and brush from the creeks as the erroneous impression prevails that the logs are infested with the leeches and if the logs were removed the fish would not be affected. The common leech occurs in many fresh water streams and lakes and inhabits the gravel and rocks in the beds of the streams. It may be found on the logs and pieces of wood in the creeks, but only incidentally, as its native habitat is in the bottom of the streams among the gravel and rocks, and under the bank where it finds lodgment. It is parasitic on fishes, and if all the logs and wood in the streams entering Lake Tahoe were removed, the leeches would be present just the same. As soon as the fish enter the creeks from the deep water of the lake and come into the shallow water, the leeches attach themselves to the gills and mouths of the fish and in a short time the fish become greatly emaciated from loss of blood. When the leeches are gorged they drop off the fish and bury in the gravel at the bottom of the creeks. Where the leeches are numerous and a large number attach themselves to a trout the loss of blood is great and the fish often dies; but the number actually killed is not as great as some persons imagine. The trout are naturally weak during the spawning season and some of them perish from their efforts in spawning as well as from the leeches. The trout artificially spawned at the egg collecting stations escape many of the dangers incidental to spawning in the creeks, such as the ravages of leeches and the grab hooks and spears of poachers.

Brookdale Hatchery.

Brookdale Hatchery was operated during the seasons of 1915 and 1916 under a lease procured from Santa Cruz County. The eggs were collected at Swanton from Scott Creek. Under the conditions of the lease the county of Santa Cruz receives annually 500,000 steelhead trout fry to be distributed entirely in the public waters and the remainder of the eggs and fry are disposed of at the pleasure of the commission. The last two seasons' operations were productive of good results. In the season of 1915, there were 1,070,000 fry reared and distributed from Brookdale Hatchery and 2,287,000 eyed eggs were shipped to other stations to be reared and distributed in other sections of the state. There were 678,000 eyed eggs shipped from Brookdale Hatchery to Sisson Hatchery, and 877,000 fry distributed in the waters of Santa Clara, Santa Cruz and Monterey counties during the season of 1916. The distribution of fry from Brookdale Hatchery during the season of 1915 will be found in the statistical table of this report (see appendix).

Ukiah Hatchery.

Ukiah Hatchery was run as usual during the seasons of 1915 and 1916. Steelhead eggs were shipped to this station from the Snow Mountain egg collecting station. The fry were given a wide distribution in Sonoma and Mendocino counties. During the season of 1916, while removing the Price Creek Hatchery to its new location on Fort Seward Creek, 1,000,000 quinnat salmon eggs were hatched at Ukiah Hatchery for distribution in Mad and Eel rivers.

Fort Seward Hatchery.

Owing to the undesirable location of the Price Creek Hatchery, it was decided to remove it to a more favorable site. Price Creek Hatchery was located on Price Creek, one-half mile from its junction with Eel River. The creek has its source in the hills near the mouth of Eel River. The country through which it flows is a loose, friable and disorganized formation that is constantly sliding and washing away. During the winter months the creek was so full of sediment that it was only with the greatest skill and care that fish could be reared at all. In the spring the water dried up rapidly and became very warm so that it was impossible to hold the fry later than June. The commission decided to remove the hatchery to a more favorable location. The Department of Fish-culture was instructed to select a suitable site and to move the station. After a careful survey of the streams on the line of the Northwestern Pacific Railroad we selected Fort Seward Creek, a cold, clear stream flowing into Eel River about four and one-half miles above old Fort Seward, Humboldt County. The commission purchased forty acres of land near the mouth of the creek and selected a site for the hatchery about one-quarter of a mile from the Northwestern Pacific Railroad.

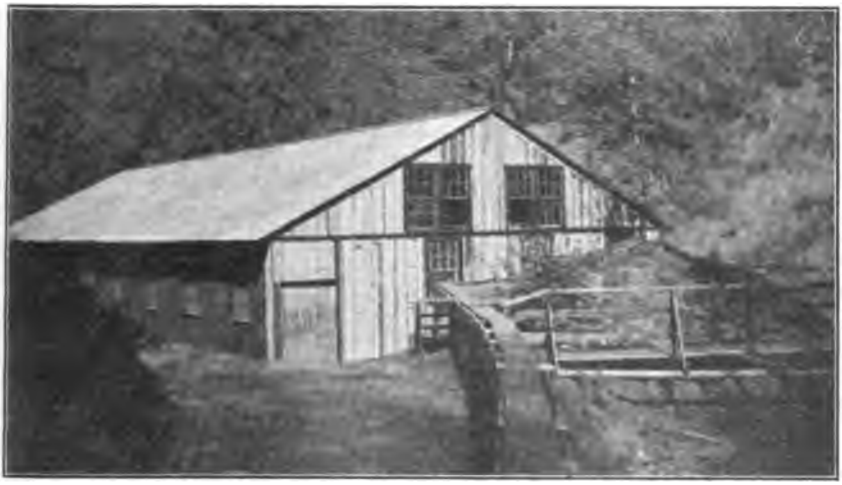


Fig. 47. New hatchery at Fort Seward, Humboldt County. Photograph by Silas Campbell.

Early in 1916, the work of moving the building, tanks, flumes, etc., from Price Creek to the new site on Fort Seward Creek was begun, and in due time it was completed and ready for the spring hatch of trout eggs (see Fig. 47). W. O. Fassett, who has been superintendent of the Price Creek Hatchery for a number of years past, was placed in charge of the new station and he has successfully carried on the work as in former years. A cottage for the superintendent and a cabin for the men was erected and finished in a rough way until more comfortable quarters could be arranged.

The building and troughs were ready for the steelhead eggs collected at the Snow Mountain egg collecting station during the spring. One million steelhead eggs were shipped to the station and the resulting fry are to be distributed in the streams of Mendocino and Humboldt counties. Besides the steelhead eggs, 100,000 rainbow trout eggs from the Lake Almanor station and 140,000 black-spotted trout eggs from the

Tahoe hatcheries were shipped to the new station for distribution in the tributaries of Mad River and Eel River.

This hatchery can be used for salmon culture as well as for trout work. Plans are being made to construct a rack across Eel River for the purpose of collecting salmon eggs for the hatchery at Fort Seward Creek. This will enable us to stock Eel River, Mad River, Elk River and several large streams on the Humboldt County coast with salmon fry. Formerly the salmon eggs for this section were shipped from the Sacramento River stations. If we are successful with this undertaking, an ample supply of eggs can be collected from Eel River without taking any from other hatcheries. Fort Seward Hatchery promises to be one of the most important stations of the commission.

Snow Mountain Station.

Early in the season of 1915, the commission secured a lease on the Cape Horn Dam from the Snow Mountain Water and Power Company for one year with the option of an additional five years. This lease gives the commission the use of the grounds and buildings as well as the privilege of constructing tanks, traps, etc., on the land described in the lease. Snow Mountain Station is one of the best steelhead egg collecting stations on the coast. The dam that makes it possible to collect the fish is located on the south fork of Eel River about twenty-five miles from Ukiah, Mendocino County. All the steelhead trout that ascend this branch of Eel River are easily trapped in the fishway over the dam. Last spring a series of tanks were arranged to hold the fish near the hatchery building. This tank system was arranged under the supervision of F. A. Shebley, a skilled fishculturist, who has made the work of holding large fish a specialty. The tanks and traps are so arranged that a portion of the mature steelhead trout are allowed to ascend the river above the dam to deposit their spawn and thus keep up the supply of fish in the extreme upper reaches of the streams tributary to this branch of Eel River.

Considerable complaint has been made by local residents regarding our operations at Snow Mountain Station. The claim has been made that not enough fish were allowed to pass the dam to keep the upper reaches of the river stocked. A hearing was held at Upper Lake, Lake County, on April 2d, by representatives of the commission. The meeting was well attended, about sixty persons being present. It was decided, after the hearing, to arrange a flume from a point near the tank house, where all the fish not needed for spawning purposes could be separated from the ripe fish and allowed to pass above the trap so they could ascend the river to the spawning grounds on the upper reaches of the river. This will be of considerable benefit if the fish are allowed to ascend the stream unmolested. There are a great many of these fish taken by the local residents before they arrive at the spawning grounds, in spite of the vigilance of the deputies. The idea prevails among some of these people that these large trout are salmon and that they will die as soon as they spawn. The steelhead is a true trout and not a salmon and will spawn several times if not taken or killed. A sufficient number of these fish will be allowed to ascend the river above the dam each season to keep the upper part of the river stocked by natural spawning.

Wawona Hatchery.

Wawona Hatchery has not been operated for the last two seasons, and fish were shipped from Sisson to supply the region covered by this hatchery. The station was operated during the season of 1914, and the distribution of black-spotted and large lake trout fry in the counties of Mariposa and Madera will be found in the statistical report (see appendix). This region will be supplied from the Inyo Hatchery next season, and we would, therefore, recommend that the Wawona Hatchery be abandoned.

Bear Valley Hatchery.

During the fall of 1914, San Bernardino County established a small hatchery on one of the tributary streams flowing into Bear Valley Lake. The object of this hatchery was to propagate rainbow trout from the fish in Bear Valley Lake. Bear Valley Lake, locally known as Big Bear Lake, is a body of water seven miles long and one and a half miles wide at its widest part. It is an artificial storage lake lying in the heart of the San Bernardino mountains about thirty miles from San Bernardino at an elevation of about 7000 feet.

This lake was stocked a number of years ago with rainbow fry from Sisson Hatchery and these fish have thrived remarkably well. The commission operated this hatchery during the seasons of 1915 and 1916. The first operations resulted in an output of 413,000 fry, all of which were planted in Big Bear Lake and in the streams of San Bernardino County.

Our crew of spawn-takers arrived at Big Bear Lake on March 16, 1916, prepared to exceed last season's take of eggs. Torrential rains during the winter had caused the mouths of the creeks to be filled with debris, which caused the fish to be delayed in entering the streams and the female trout became overripe before the first fish were spawned. Consequently the percentage of fertilization was not as good as expected. The rising surface of the lake, caused by the dam being raised, made a change in the shore line and the mouths of the creeks being closed in the beginning of the season by detritus carried down by the winter storms, embarrassed the operations to a considerable extent. Our men had to remove the sand bars and other debris that had been deposited at the mouths of the creeks, before the fish could enter. The fish being retarded, the eggs were affected by over-retention, and a high percentage of fertilization could not be obtained. The eggs that were fertilized hatched well and produced a lot of strong, healthy fry. The result of the season's operations was 750,000 fry, which are being distributed in Big Bear Lake and the streams of San Bernardino County. The county game warden, Mr. Malone, will assist in the work of distribution. In the table of distribution will be found the list of waters stocked with trout fry from this station during the season of 1915.

It is planned to get everything in readiness this coming fall so that there will not be any delay this coming season in collecting the eggs from Big Bear Lake. This will prove to be a valuable egg collecting station, as it will supply the streams of San Bernardino County that are situated far from the railroad in the heart of the San Bernardino mountain range.

Almanor Hatchery.

In an effort to increase the take of rainbow trout eggs during 1916, plans were made to establish an egg collecting station at Lake Almanor, Plumas County. The take of rainbow eggs at the Bogus and Camp Creek stations, on the Klamath River, was light, as this proved to be an off season on the Klamath. The run of fish in the tributaries of the Klamath River is very irregular, as our records for twenty-five years past will show. Whenever weather conditions are not propitious the fish do not run regularly and straggle along for months. Consequently the take of eggs is always light during such seasons. Early in 1916 we were satisfied that the take of eggs at these stations would be light, so we planned accordingly to make an effort to collect eggs elsewhere. Having heard that there was a considerable number of rainbow trout each spring in the North Fork of the Feather River at the outlet to Lake Almanor, Mr. Hunt, our Field Agent, was instructed to investigate and report on the chances of collecting eggs at this place. He reported the condition was favorable for a good take of eggs.

We secured permission from the Great Western Power Company to operate on their property at the Lake Almanor Dam. The company also kindly gave us the use of their buildings in which to establish a temporary hatchery. The crew worked under difficulties. The snow was deep and it was difficult to get the supplies and equipment to the station; but in spite of the difficulties, we collected 1,635,000 eggs and successfully held them until they were ready for shipment. Fort Seward Hatchery received 100,000 eggs, 240,000 were shipped to Tahoe Hatchery, 840,000 to Sisson Hatchery, 100,000 to the Nevada State

Fish Commission, and the remainder were hatched and distributed in the local streams and in Lake Almanor.

Reports were received that a good run of rainbow trout ascended Rice Creek, a tributary of the North Fork of the Feather River above Lake Almanor. After making an examination of the stream and gathering data from the local residents we have decided to establish an egg station there this fall, so as to have it ready for next spring's work.

We have located a site for a small hatchery and egg station at Domingo Springs. Domingo Springs is on the main road leading from Chester to Red Bluff, and is one-half mile from Rice Creek Falls, where we have selected a site for a trap and retaining tanks for our egg collecting station. The water from Domingo Springs gushes from the lava rocks at the foot of a cliff near the road. There is about 300 inches of water in the springs, an ample supply for a fair-sized hatchery, should it ever be necessary to operate one in that section on a large scale. We have a permit from the United States Forestry Department for the hatchery site at Domingo Springs, as well as for the trap and tank site on Rice Creek.

Next season we will operate a trap in Rice Creek to determine the number of eggs that can be collected and if our efforts are successful we will make this a permanent egg collecting station and establish a small hatchery at Domingo Springs to supply the district west and north from Lake Almanor, as well as to keep up the supply of trout in the lake.

Burney Creek Station.

In the spring of 1915 we secured a lease on a piece of land at the mouth of Burney Creek, a tributary of Pit River, Shasta County, for the purpose of collecting rainbow trout eggs. A rack was placed across the stream and the necessary live cars and pens were made to hold the fish that we expected would enter the creek. A tent and a few troughs under it, with our hatching equipment, was set up and operations were begun with the intention of collecting and eyeing eggs preparatory to shipment to Sisson.

It was originally planned to eye the eggs and hatch them in the old Hat Creek Hatchery, seven miles from Burney Creek, if a sufficient number were taken; but early in May an eruption of Mount Lassen sent a tremendous flood of mud, water and sand down the Hat Creek Valley, destroying all the fish in the stream from its source to its confluence with the Pit River. This was one of the most serious destructions of fish life in recent years in California. Hat Creek rises in the southeastern part of Shasta County in a lake at the foot of Mount Lassen, at an altitude of 7300 feet above sea level. It flows northerly into the Pit River, two miles northwest of Carbon, where the old Hat Creek Hatchery was located. It is thirty-eight miles in length. Its principal tributary is Rising River, a short stream arising from large springs in the lava. It is only two miles in length, but has an average flow of 380 second feet of water. Hat Creek, before its confluence with Rising River at the town of Cassell, has an average flow of about 100 second feet during the summer months. Hat Creek and its tributary. Rising River, were noted for the excellence of their rainbow trout. After the flood of mud and sand from Mount Lassen, the only survivors in the valley were those that were in Rising River. The water was muddy all during the season of 1915 and during the last year continued so muddy that it was not considered practical to restock the stream. It will probably be several years before fish will again thrive in Hat Creek, as the shifting sand deposited by the volcano destroys all the insect life in the stream, as well as making it uninhabitable for trout.

The fish enter Burney Creek late in the summer, but the run is a protracted one, lasting from April to August. The fish are late in developing and if the fry were reared in a higher altitude and the progeny spawned later each season, a fall spawning rainbow trout could be developed. This would probably have some advantages over a spring spawning fish, as such trout would be in fine condition for the anglers when the fishing season opens in the spring.

The eggs collected during the season were eyed at Burney Creek Station, and 200,000 were shipped to Sisson Hatchery, from which station they were distributed to different sections of the state. Owing to heavy operations at other stations, Burney Creek was not operated during the season of 1916.

A Southern California Hatchery.

During the summer of 1915 the commission again took up the matter of constructing a hatchery for southern California. A hatchery for southern California has been advocated for several years, but to find a location where the water, climatic conditions and transportation facilities were suitable for a hatchery large enough to supply the region south of the Tehachapi and the country lying to the east of the San Joaquin Valley, was not easy. The hatchery department had made investigations and gathered data on the best streams in the country south of the Tehachapi, but none of them was found to meet all the requirements necessary for the proposed hatchery. Some of the sites were inaccessible, others too far from railroad transportation, but the great majority of them, although located where the water was pure and in sufficient quantity, were undesirable because the water was used for domestic purposes. In October, 1915, Commissioner M. J. Connell notified the Department of Hatcheries that he had found an ideal stream of water on which to locate a hatchery such as the board had been looking for. He called our attention to Oak Creek, Inyo County, and ordered the Superintendent of Hatcheries to make a report on the stream.

Oak Creek was found to be the largest and most important stream that enters the Owens River Valley in the region of Independence. The reason for selecting the region near Independence was to enable the commission to secure an ample supply of eggs near the hatchery. Mr. Connell had found that a series of lakes, situated in the high Sierra region west of Independence, were teeming with rainbow trout of an excellent quality and from which millions of eggs could be procured. These lakes are in a glacial basin and are known as the Rae Lakes.

Oak Creek enters the valley about five miles north of the town of Independence. It has an abundance of pure, cold water. The maximum flow (which is in June) varies from 20 second-feet to 200 second-feet, depending on the depth of the snow that falls on the upper reaches of the stream, and the rapidity with which it melts during the first warm spell in the early summer. The average minimum flow for the last six years was 8 second-feet, and this late in the fall. This stream will supply a hatchery station with a capacity of from 10,000,000 to 12,000,000 fry. As the largest number of fish are handled during the maximum flow, this creek supplies almost an unlimited flow of water for hatchery purposes. The source of Oak Creek is in the precipitous range of mountains on the west side of the valley at an altitude of about 10,000 feet. Its descent is very rapid until it reaches the floor of the valley. From its source on Diamond Peak and Black Mountain, the main stream, or the North Fork, is 8 miles long to its junction with the South Fork, which rises on the southeastern slope of Black Mountain and is also about 8 miles in length. The South Fork falls from its highest source to its junction with the North Fork 7100 feet in a distance of 8 miles. The North Fork falls 8700 feet in its course from the source to its junction. The confluence of the two forks of Oak Creek is about 1½ miles from the base of the range in the Owens River Valley. The land slopes gently toward the plain on a gradient of about 4 per cent.

About one-quarter of a mile below the junction of the two forks of the stream, the commission secured forty acres of land on which to establish a hatchery. On this site a large hatchery is now being erected. The building now under construction is 192½ by 45 feet, constructed of natural stone, gabro and granite, found on the floor of the valley (see

Fig. 31). The building will contain offices, storerooms and a laboratory on the lower floor and living quarters for the help in the upper story of the structure. It will be equipped with up-to-date plumbing. All the troughs will have a separate water supply. The aerating system will be on the latest and most modern lines. The waste pipes, catch basins and drains will all be of cement. The arrangement of the whole system when completed is expected to be the latest and most improved in fishcultural work.

The supply of eggs will be procured from the Rae Lakes—a system of lakes lying in the heart of the Sierras at an elevation of 10,500 feet above sea level (see Figs. 48 and 49). These lakes were stocked by a party of enterprising citizens from Owens River Valley, under the leadership of Geo. W. Naylor of Independence, former sheriff of Inyo County and now a member of the board of supervisors. The fish were taken from Charlotte Lake and transplanted to the waters of Rae Lakes sixteen years ago. The original stock came from Kings River and were transplanted into Charlotte Lake. A recommendation will be made to the next legislature to set aside the Rae Lakes as a fish preserve for the purpose of protecting the brood fish for their eggs. This is necessary to supply the large new hatchery with an ample supply of eggs.

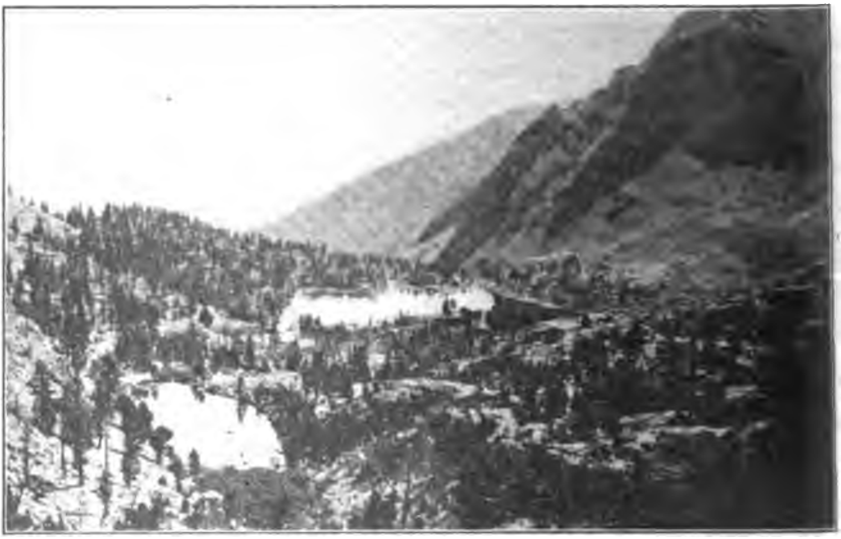


Fig. 48. Lower Rae Lakes. Photograph by J. C. Von Blon, August 17, 1916.

Distribution from the hatchery now being constructed on Oak Creek can be made to all points in southern California as far north as Merced and from there to the Yosemite Valley, easier and better than from any other point where hatcheries can be operated. It will take fourteen hours from Owenyo, the point on the railroad where the fish cars will be loaded, to Los Angeles, and about seventeen hours to Merced. This will allow of the planting of the fry in the shortest possible time from any of the large hatcheries in California. This site can not be excelled for many reasons: first, there is a great amount of pure water in Oak Creek; second, the climatic conditions and altitude for the rearing of fry are ideal; third, a large number of spawn fish can be taken from the Rae Lakes and transferred to the hatchery; fourth, the hatchery is centrally located, where all southern California and the mountain district adjacent to the San Joaquin Valley, including the Yosemite National Park, as well as the region north to Mono and Alpine counties, and the hundreds of barren lakes in the southern high Sierras, can be kept stocked with less expense than under any other system of hatchery work.

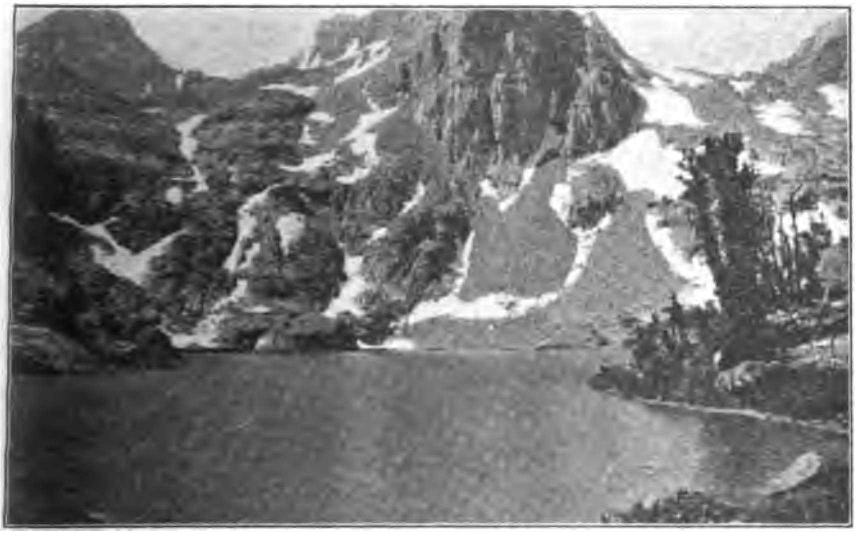


Fig. 49. A near view of one of the Rae Lakes where trout eggs are to be obtained for the Inyo Hatchery. Photograph by R. D. Duke, August 17, 1916.

Acknowledgments.

The commission acknowledges its appreciation and gratitude to the following railway and transportation companies:

The Southern Pacific Railroad Company, Western Pacific Railway Company, Northwestern Pacific Railroad Company, Santa Fe Railway Company, Nevada-California-Oregon Railroad Company, Lake Tahoe Railway and Transportation Company, Ocean Shore Railroad Company, Sierra Railway Company, California Western Railroad and

Navigation Company, Amador Central Railroad, McCloud River Railroad Company, Yreka Railroad Company, Oakland, Antioch and Eastern Railway Company, Northern Electric Railway Company, San Joaquin and Eastern Railroad, Visalia Electric Railroad, Yosemite Valley Railroad and Virginia and Truckee Railroad, for the free transportation of the employees of the hatchery department in care of the eggs and fish, and for the free transportation of our distribution cars. Without their assistance our work would be restricted very materially.

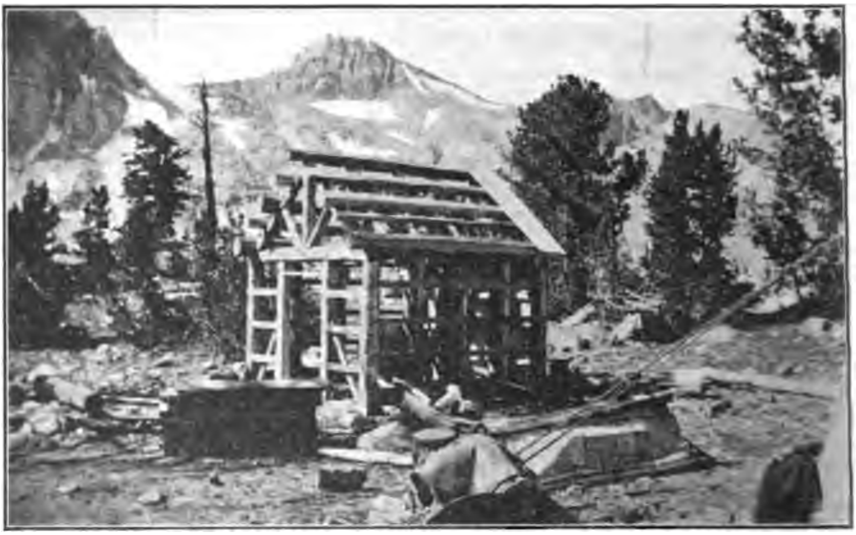


Fig. 50. New egg collecting station at Rae Lakes, showing the type of structure that must be erected to withstand the heavy snows at elevations above 10,000 feet. Photograph by F. H. Shebley.

Recommendations.

The most important recommendation that we desire to make is one in regard to dams in rivers inhabited by migratory fish, particularly salmon. We would recommend that a law be passed the same as the proposed federal law for the territory of Alaska. A law should be passed providing that any person or corporation desiring to construct a dam or obstruction in any stream in which migratory fish exist to a height that will make a fishway thereover impracticable, in the opinion of the Fish and Game Commission of the state of California, shall secure a site and erect thereon a hatchery, dwellings for the help, traps for taking the fish and all equipment necessary to operate a hatchery station according to the plans furnished by the Fish and Game Commission, and to convey the same to the commission when completed. If a site is not available or the water not suitable at or near the dam, the owners or occupants of such dam shall erect a hatchery and equip the same at any point below the dam that the Fish and Game Commission may select for the purpose of propagating the eggs from the fish that are obstructed in their ascent of the river by the dam or obstruction.

This concludes our report. A great many other recommendations could be made regarding the changes in the fishway law, trout seasons, salmon laws, etc., but we will make these recommendations in a separate report on that subject.

We wish to express our appreciation and thanks to your honorable board for the support that you have given us and those associated with us in this work. The earnest support of our superiors and the efforts of our assistants have made the last two seasons work the most successful of any in the history of the commission.

Respectfully submitted.

W. H. SHEBLEY,
In Charge, Department of Fishculture.

REPORT OF DEPARTMENT OF COMMERCIAL FISHERIES.

The Honorable Board of Fish and Game Commissioners.

GENTLEMEN: The recent rapid growth of our fisheries has made it necessary to obtain more detailed and accurate knowledge of our fishery resources than has yet been attempted, if they are to be intelligently conserved. The development of the tuna, sardine and kelp industries has done much to awaken public interest, and there is a demand that some study be made of the albacore (tuna) and that the effect of cutting the kelp for potash be investigated. In order to more efficiently handle the problems arising and to meet the necessity of obtaining a better knowledge of our fisheries, the Department of Commercial Fisheries was formed early in the year 1915.

Before this department was permanently formed the fishing methods employed in the different fisheries and the methods of canning and curing were studied. The more important fisheries were rather hurriedly investigated during the year preceding the last legislative session that the commission might be better able to aid in the enactment of laws governing the fisheries. Some very good and important legislation was the direct result of this study, chief of which was: a redivision of the state into fish and game districts to fit the need of the commercial fisheries; a closed season and regulations for salmon and steelhead fishing on Eel River that would do much to conserve both the salmon and steelhead and at the same time fairly well satisfy the two opposing factions, the sportsmen and commercial fishermen; a better season for Mad and Smith rivers; a closing of the Sacramento River to nets above Vina and the protection of the summer run and part of the spring run of salmon in the district from Colusa to Vina; the closure of many streams and sloughs that were not capable of sustaining net fishing: the abolition of the paranzella net in southern California, a net which nearly ruined the southern halibut supply; the reestablishment of the trammel net in southern California that it might take the place of the paranzella net without destroying the young fish as did the paranzella; the establishment of a uniform and just minimum mesh for salmon and striped bass on San Francisco Bay and the rivers; a uniform catfish law for the Sacramento and San Joaquin rivers; and a law requiring fish handlers and dealers to report the quantities and kinds of fish handled each month.

Since the formation of this department we have considered it of first importance to gather accurate and detailed information concerning the present commercial fisheries of the state, with the ultimate object of building up these industries and at the same time conserving the marine species upon which these industries depend, and to investigate and aid in the development of our latent and undeveloped fishery resources.

We are recording the results of our work in the form of permanent notes, which are filed in such form that they will become the property of the state and can be referred to readily and be used by anyone who may wish to continue the work. Much valuable information has been lost in the past because it was not filed. We plan, as soon as we have sufficient data on any one fishery, to put the information in the form of reports accompanied by illustrations, so that it can be published. We have published reports on the tuna, shad and paranzella fisheries and are prepared to publish reports on the salmon, sardine, striped bass, rock cod, crab, catfish and abalone fisheries.

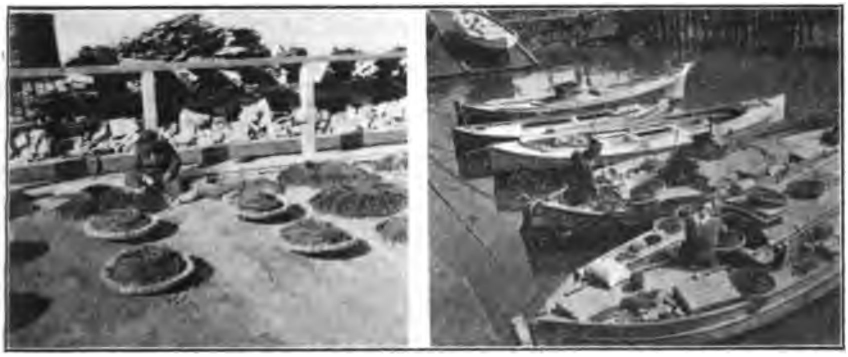


Fig. 51. Rock cod fishermen at Fishermen's Wharf, San Francisco. Photographs by A. M. Fairfield.

A law enacted by the last legislature requires dealers and handlers of fish to make an accurate monthly statement of the quantity and varieties of fish handled and where they were caught. We have considered it of the greatest importance that this law be enforced and that the reports be complete and accurate. To that end a list of all the dealers of the state required to make this report was compiled and printed blanks issued to each. The law went into effect in August, 1915, and we have been able to get a very complete and accurate record of the fish handled since the 1st of October, 1915. This record, if kept up, will show the decline or rise of any fishery and the season of each variety of fish. This, supplemented by the number of boats, men, nets and the intensity of the fishing, which we are obtaining, will give us the basis upon which all conservation measures must rest. We are publishing the statistics as we gather them in the quarterly bulletin, CALIFORNIA FISH AND GAME, along with other contributions on subjects of interest concerning the fisheries.

We have investigated, as far as we could, the fish marketing problems; the sanitary or unsanitary handling of fish by fishermen, by markets and in shipment; the cold storaging of salmon, the utilization of fish waste for fertilizer or for chicken feed. We have, since the first of the year 1916, been gathering data regarding the prices paid the fishermen and the prices paid by the retailer and consumer for the different varieties of fish in representative towns in the state. Since the appointment of the State Market Director we have given him the results of our work and have cooperated with and aided him in every possible way. Practically all of the recent data on California fisheries which are available are the result of the work of this department of the Fish and Game Commission. Now that he has taken up the fish marketing problem, we will be relieved of much of that part of the work, as it more properly belongs to him. We will probably continue, at his request, to aid in certain lines where our facilities for obtaining information are better than his.

We have been appointed a member of the Northern California Fish Exchange Committee as organized by the State Market Director. This exchange consists of five members, the fishermen, the wholesalers, the retailers, the State Market Commission and the Fish and Game Commission each being represented by a member on the committee. The last two named members are to represent the people of the state. The object is to unite the producer, the dealer and the people for their mutual benefit and fix each day the maximum price the consumer shall pay. Under the arrangement a certain per cent will be collected from the business for advertising, by which means it is expected to induce the people to use fish every day of the week and thus increase consumption, lessen the cost to the consumer and help develop our fisheries.

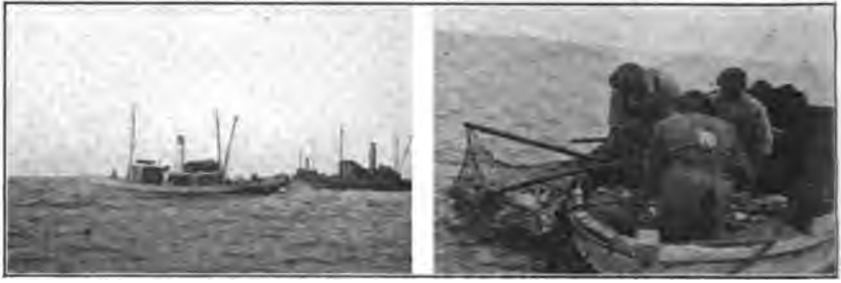


Fig. 52. Sole and sand-dab steam trawlers working out of San Francisco and a Santa Cruz gasoline trawler hauling in catch. Photographs by H. B. Nidever.

The working rules of the Fish Exchange Committee provide for the adjustment of differences or disputes between the fisherman, wholesaler, retailer or the public. They provide the first good opportunity the fishermen have had of presenting their side of the case and decisions reached by the committee should have great weight with the legislature. It will be the particular duty of the representative of the Fish and Game Commission to represent the fish themselves; in other words, to see that our fishery resources are conserved.

A survey of the economically important shellfish of the state, begun several years ago, has been taken up and completed under the direction of Dr. Harold Heath of Leland Stanford Junior University. A full report is in preparation. In connection with this work, Pismo clams were transplanted to several suitable beaches in San Luis Obispo County and an extensive plant of eastern softshell clams made in Morro Bay, which appears to be especially well suited to them. A report of this work was published at the time in CALIFORNIA FISH AND GAME.

In 1911 and 1912, under the direction of Dr. C. H. Gilbert of Leland Stanford Junior University, the Fish and Game Commission liberated large numbers of marked quinnat salmon fry in the Sacramento River, Scott's Creek and San Lorenzo River. This was the most comprehensive fish marking experiment ever undertaken. More than 200,000 marked salmon fry were liberated and it was expected that many important facts regarding the life of the salmon would be learned from these experiments. The fish resulting from the first fry liberated were in their fourth year in 1914, at which time they were expected to appear in Monterey Bay and in the streams where they were liberated. In order that we might recover as many as possible of these fish we distributed circulars to all handlers of fish on Monterey Bay and to all handlers of fish from San Francisco Bay and rivers. These circulars contained a diagram of a salmon to illustrate the different marks and full directions as to how to take samples of scales and make a record of each fish. The commission's deputies at Monterey, Santa Cruz, San Francisco, Sacramento and on the bay and river patrol boats assisted in the recovering of these fish. The fish dealers were much interested and gave every assistance. We personally visited nearly every one of these people to explain the importance of recovering these fish. We had envelopes printed and distributed which could contain a sample of scales from each and the record of each as to size, sex, kind of mark, etc. The number recovered was disappointing.

In the year 1915, partly because we were better prepared to carry on the work, the number recovered was considerably larger. By placing a rack across the San Lorenzo River we were able to get a good record of the marked fish entering that stream. A few fish were taken in Monterey Bay in 1916, but not many were expected as they are now in their sixth year. As yet the material and records obtained have not been studied further than to determine that the method employed in ascertaining the age of salmon from the scales is accurate. While the total number of fish recovered was disappointing the material and data collected is very valuable, and when properly studied and reported upon, will be a most valuable contribution to our knowledge of the quinnat salmon.

DEVELOPMENT OF CALIFORNIA FISHERIES.

In the following we give the important developments in our fisheries:

The Long-finned Tuna or Albacore.

Since our report on this industry in the last biennial report of the Fish and Game Commission the fishery has continued to grow until it now more than doubles in value and importance either the salmon or sardine industry.

In 1914 the tuna pack was 325,000 cases of one-pound and half-pound cans. The pack for 1915 was 360,286 cases, of which there were 136,046 cases of one-pound cans, 172,263 cases of half-pound cans, and 51,977 cases of quarter-pound cans, with 48 cans to the case. For this pack there was required 23,500,000 pounds of round fish, and the wholesale value of the pack was $2,300,000. Besides the tuna that were canned more than two million pounds were dried, smoked, salted and used fresh.

During 1915 twelve tuna canneries were in operation in southern California and in 1916 the number has been increased to sixteen, which during the season give employment to 1800 people. The amount invested in buildings and equipment is $910,000. About 400 fishing boats valued at $1,000,000 are employed, and the number of tuna fishermen is 1200.

The remarkable feature of the season of 1915 was the large take of tuna in November. The demand for canned tuna is now so great that it exceeds the supply and the prices obtained are high. Most of the canneries have been enlarged in anticipation of a larger catch, but unless a good catch is made late in the year, as happened last season, the pack is likely to be less for 1916. The tuna packers are anxious to have the migration and life history of the albacore investigated. They would like to know how much fishing the albacore will stand and what measures, if any, will be needed to conserve the industry. We have no conservation measures to propose, for the albacore that appear in our waters are mostly mature and are here in search of food. Any important conservation measures that may be needed would have to be applied in Mexican waters, for it is there they spawn and it is there the young are found. The industry in this state will adjust itself to the number of fish that come this far north, but the tuna packers would naturally like to know beforehand how much the fish will stand, that they may regulate their industry accordingly. So far no serious attempt has been made to can the albacore in Lower California. It is believed that albacore may be taken throughout the year near Cape San Lucas, Lower California. If this is true and a large canning industry should be built

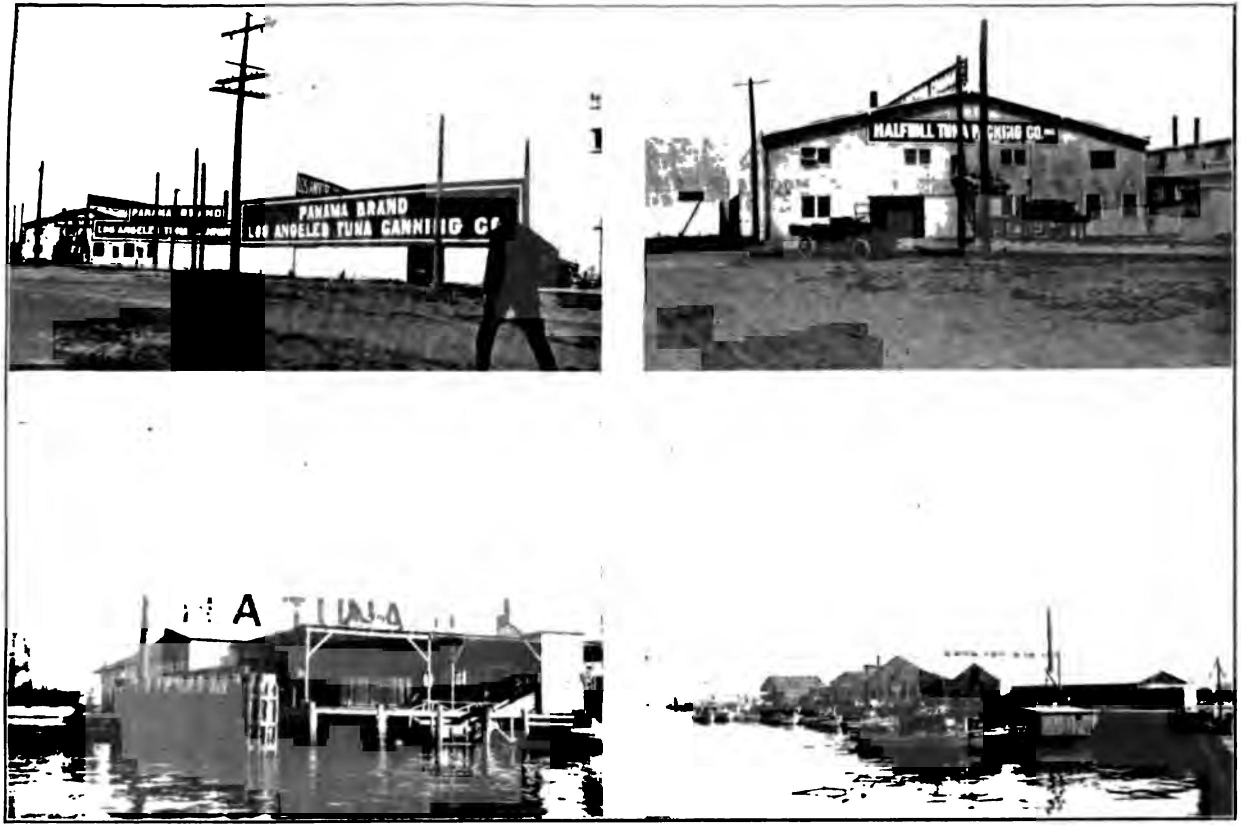


Fig. 53. Tuna canneries of Los Angeles Tuna Canning Company, Long Beach; Halfhill Tuna Packing Company, Long Beach; North American Tuna Canning Company, Terminal Island; and Stafford and Crandall and Tweedale companies at Wilmington. Photographs by H. B. Nidever.

up at that point, it would probably seriously affect the supply of fish in this state.

The difficulty of securing live sardines and anchovies for bait is still the serious problem that it was when we last reported. Attempts have been made to use large purse nets to capture the albacore and thus get along without bait, but the expense of operating the nets has been so great and the catch so small that the method has been abandoned. Large circle nets have been successfully used in Japan for these fish, but it is doubtful if they will ever be a success here as our fish seldom appear in compact schools.

Fig. 54. Tuna fishermen's boats at San Diego. Photograph by H. B. Nidever.

Salmon.

Only two species of salmon are taken commercially in California, the quinnat or chinook and the silver or coho. A few individual dog and humpback salmon are occasionally found entering our small streams. The silver salmon enters nearly every stream of any size from Monterey Bay north, with the exception of the Sacramento River, but is not taken in any quantities except in the Eel, Klamath and Smith rivers. The quinnat or chinook is the principal salmon of Monterey Bay and the Sacramento, Eel, Mad, Klamath and Smith rivers.

SALMON CATCH FOR THE YEAR 1915.

Monterey Bay (chinook)	3,045,446 pounds.
San Francisco Bay and lower rivers	4,374,932 pounds.
Sacramento River above Colusa	172,389 pounds.
Total	7,592,767 pounds.

This amount was utilized as follows:

450,000 pounds canned.
2,742,400 pounds mild cured.
750,000 pounds hard salted.
3,650,367 pounds used fresh.

At Fort Bragg, Mendocino County, 56,247 pounds of chinook salmon were taken by trolling in the open sea and shipped to San Francisco. The combined catch on the Eel, Mad, Klamath and Smith rivers was: 1,649,189 pounds chinook and 286,719 pounds silver salmon. Of this amount, 1,063,189 pounds were canned, 840,908 pounds were used fresh and 32,000 pounds were mild cured.

The total catch for the state was 9,298,203 pounds chinook and 286,719 pounds of silver salmon. In addition to this there were taken in Eel and Mad rivers, 33,204 pounds of steelhead, which were marketed fresh.

The 1916 salmon catch for the six months ending June 30th was:

Monterey and Santa Cruz	3,848,073 pounds.
San Francisco Bay and lower rivers	983,979 pounds.
Sacramento River above Colusa	149,080 pounds.

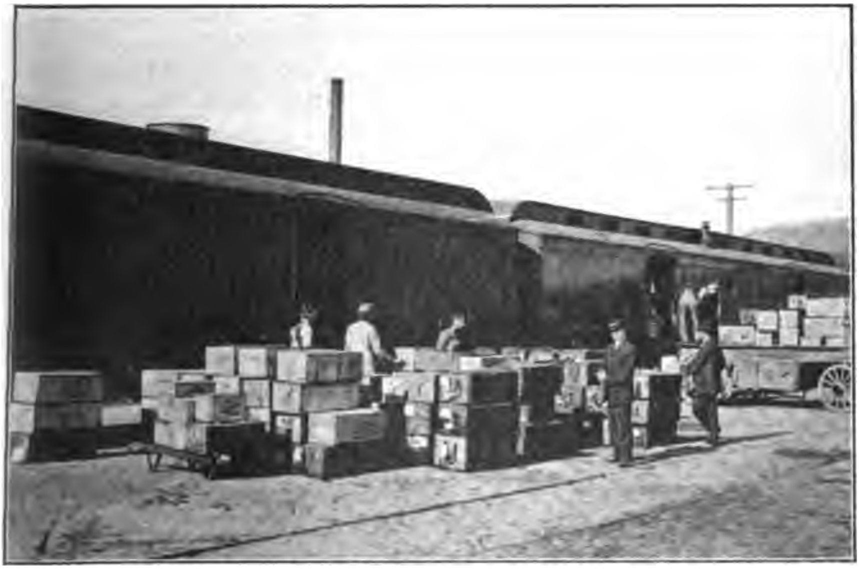


Fig. 55. Loading 150 boxes of fish, principally salmon, at Monterey. Photograph by A. M. Fairfield.

The salmon of the Sacramento River are apparently holding their own, if we include the salmon taken in Monterey Bay and outside the Golden Gate, as it is proper to do. While our figures for the catch of Sacramento salmon for 1915–1916 are not up to the estimates of former years, they are undoubtedly nearer the actual average yearly catch, as figures in the past have been principally estimates with the usual tendency to avoid underestimating the catch. The fall run on the Sacramento has been less than the average for the past few years on account of the greatly increased catch outside and in Monterey Bay.

A few years ago a half-million pounds was a good catch on Monterey Bay. In 1914 the catch was two and one-half million pounds. In 1915 it jumped to three million pounds and up to June 30, 1916, the catch for Monterey Bay and outside "The Heads" exceeded four million pounds. In 1916 the greatest catches in Monterey Bay were made in May. About 400 boats were engaged in trolling and the record day's catch for all boats was 85 tons. This year the run was followed up the coast by the fishermen. Early in August the boats were making good catches near Davenport, above Santa Cruz, and in a few days they were just south of the Golden Gate. For nearly three weeks the salmon remained outside, part of the time north and part of the time south of the entrance. Nearly one hundred boats trolled for the fish while they were off the Golden Gate. On one day over 50 tons were taken. Many small salmon were taken during this run outside San Francisco Bay, a large number being less than five pounds in weight. Such a run of small fish was never observed here before.

The spring run of salmon on the Sacramento River has been poor for the past seven or eight years. Several reasons have been advanced for this: That no protection of a closed season is given the spring run as is given the fall run; that the seines in the upper river have taken the spring fish principally and have allowed very few to pass to the spawning beds; and that little attention is given to the artificial propagation of the spring run. These theories are all based on the supposition that the two runs are practically distinct and that spring run salmon make spring run salmon and fall run salmon make fall run salmon. As a matter of fact, the actual relationship of the two runs has never been demonstrated. It is the belief of fishculturists, however, that the fish resulting from the eggs laid down by either the spring or fall fish are more apt to return as fall fish. Theoretically the progeny of the spring run fish have a better opportunity to survive and pass out of the river to the sea as good sized fry than have the progeny of the fall run fish.

For the purpose of giving the spring fish a better chance to reach the spawning grounds in the upper waters of the river, a law was passed at the last session of the legislature which prohibits netting in the river above Vina and provides a closed season for the district from Vina to Colusa from May 15th to the end of the year. It was hoped that as a result of this measure, the one hatchery that operates on the spring run—the federal hatchery on the McCloud River—would be able to take a large number of eggs, but unfortunately they failed to operate the hatchery this spring; nor did they operate last year for the spring run. We are informed by our deputies that a much larger number of salmon ascended McCloud River this summer than last year, which indicates that this upper river salmon protective measure has had the desired result and that the natural hatch will be increased thereby even if the artificial hatch is not.

Shad.

Only a few years ago the shad was so plentiful as to be almost a nuisance, but now it is being overfished and protective measures will be necessary to prevent serious injury to the supply. The Chinese shrimp fishermen, when they were compelled to discontinue shrimp fishing in 1911, prepared to salt shad for the markets of China. They began operations in the spring of 1912. The next year saw some of our larger fish handlers in the business. Figures are lacking for the first years, but in 1915, 2,400,000 pounds were dry salted; besides this, 100,000 pounds of fresh shad roe were used locally and shipped East and 606,048 pounds were canned in half-pound cans. About 350,000 pounds of the fish were used fresh within the state and 360,000 pounds of round fish were canned, making a total of 3,816,048 pounds for the year. On account of the increased water freight ratés no shad were dry salted for the Chinese trade this year, but the increased demand for canned shad and for our fresh shad in the eastern United States resulted in a larger catch. Thirty-three carloads of the fresh fish were shipped East, as well as twenty casks of mild cured shad, for which there is an Eastern demand developing. There were used in the fresh markets of the state up to June 30, 1916, 405,992 pounds out of a total of 4,413,675 pounds taken. A great many more were canned than in 1915.

In spite of the fact that the catch is rapidly increasing from year to year, the supply of fish is decreasing. It is estimated that the number of shad entering the river in 1915 was 40 per cent short of the year before and that the run of 1916 was 60 per cent short of the 1915 run. In fishing for shad, gill nets with a 6½-inch stretched mesh are used. This size mesh catches the roe shad only and allows the undesirable buck shad to pass through. The fishing which was formerly almost entirely in the river is now mostly in the lower bays, San Pablo Bay especially. The nets used on the flats of San Pablo Bay have, in addition to shad, been catching large numbers of striped bass which come in preparatory to ascending the river to spawn.

In 1915 accurate account was kept of the proportion of male to female shad on the upper San Joaquin River. The males outnumbered the females 20 to 1. This year the proportion is stated to be near 40 to 1 and the total number of shad appearing in the upper river is decreasing very rapidly. This difference in number between the sexes shows the intensity of the fishing. The sexes normally are about even and if the males exceed the females 40 to 1 in the upper river it means the 6½-inch mesh gill nets have captured 97½ per cent of the roe shad. As the corresponding 97½ per cent of males is useless as far as the propagation of the race is concerned, it is evident that only 2½ per cent of the run is left to continue the species, when 50 per cent would be nearer the right number. We will have one more year of this overfishing before any protective measure can take effect, and in the meantime, the shad run is likely to be nearly ruined. We very much need a law similar to that of other states which gives to the fish and game commission and to the governor of the state the authority to make regulations in cases of emergency of this sort.

Halibut.

The California halibut (*Paralichthys californicus*) has become one of our most important food fishes and the annual catch by California fishermen exceeds 5,000,000 pounds. It is found from San Francisco south, being most numerous south of Point Concepcion and in the Mexican waters of Lower California. Unlike the northern halibut, which it resembles in appearance, it inhabits the shallow water along shore and the majority of the fish marketed do not exceed 20 pounds in weight, although individuals weighing from 50 to 60 pounds are occasionally taken.

The principal methods of capture have been by trammel or three meshed nets set on the bottom and by the drag nets known also as paranzellas or trawls. The drag nets, used as they are, near shore, have proved themselves to be very destructive to the young halibut. For one ton of marketable halibut caught by this method, three tons of the young halibut too small to market were destroyed, for very few of them could be returned to the water alive. When the loss is figured in numbers instead of weight we find that more than 50 young were destroyed in capturing one of marketable size. To remedy this condition the use or possession of paranzella or trawl nets was prohibited in southern California at the last session of the legislature, and the use of the trammel net restored which, until that time, through some mistaken notion, was prohibited within one mile of shore—the only territory where they could be used. In addition to abolishing the drag net, our present law prescribes an 8-inch minimum mesh limit for trammel nets and a four pound minimum sale limit for halibut, so that this fishery is much better protected than it has ever been. It is doubtful, however, if it has protection enough, for the halibut grows slowly and has not reproduced at the minimum weight of four pounds as set by law. The intensity of the fishing for this species is bound to increase and if at any time our fishermen are excluded from Mexican waters, overfishing in our waters will be sure to take place. It may be necessary, if we are to conserve this fishery, to protect a portion of the fish of reproductive size by increasing the minimum mesh limit of the nets or by closing small areas to fishing. The halibut is another of our fishes that needs to be thoroughly investigated.

The amount of halibut taken by California fishermen between October 1, 1915, and June 30, 1916, was 3,951,690 pounds. Of this amount 1,668,814 pounds were taken in Mexican waters.

Crabs.

Crabs taken at San Francisco during the open season 1914–1915 (November 15th to July 30th) amounted to 49,716 dozens; for the corresponding season of 1915–1916, 40,370 dozens. Crabs taken in Monterey Bay during season 1915–1916 amounted to 15,037 dozens and those taken in Del Norte and Humboldt counties during the same season, 5,114 dozens.

Crabs, we believe, are adequately protected by the present law, under which the marketing or possession of female crabs or the marketing or possession of any male crab under seven inches in width is prohibited and a closed season is provided from July 31st to November 14th. With this protection there can be no serious depletion of the crabs, for a sufficient amount of breeding stock is preserved and the fishing, no matter how intense, can not go beyond the limit of the natural annual increase of these crustaceans. The San Francisco fishery seems to have reached this limit and toward the end of the season the fishermen are not able to find enough legal crabs to supply the market. During the closed season that follows, the crabs cast their shells and increase their size about one-fourth, so that on the opening of the season on November 15th the legal sized male crabs are plentiful again.

The crab fishery in Monterey Bay has had a remarkable development. Only two or three years ago there were so few crabs in that bay that it did not pay to fish for them. During the last open season, as will be seen from the figures above, over 15,000 dozens were taken. In contrast to this is the crab fishery of Humboldt County which produced less than one-third this amount. The reason for this is not the scarcity of crabs, but the fact that there is a county ordinance prohibiting the shipment of crabs out of Humboldt County. As already stated, our present state laws adequately protect the crabs, and to prohibit shipment from the county gives the crabs more protection than they need and prevents the development of a valuable industry. Under this restriction the crabs are extremely abundant and of large size, one-fourth of those caught running over eight inches in width. The fishermen instead of getting $2.00 per dozen, as do the San Francisco fishermen, get less than $1.00 per dozen. It is estimated that this fishery could supply annually at least 30,000 dozen crabs, for which the fishermen would receive $60,000, if they were given access to outside markets, instead of less than $5,000 as at present.

Shrimp.

Shrimp fishing by means of Chinese nets was resumed in 1915 in District No. 13, set off for the shrimp fishermen in the south end of San Francisco Bay. The use of Chinese shrimp nets was prohibited by law in 1911 at which time the annual catch of shrimp was near ten million pounds. Of this amount a little less than one million pounds was used in the markets of the state, the remaining 90 per cent being dried and shipped to China. In the four years following the enactment of this law no other successful method of catching shrimp was devised and most of the time shrimps were not to be found in the markets. In redividing the state into fish and game districts it was possible to set aside the south end of San Francisco Bay for the use of the Chinese nets, where it had been shown that the number of young edible fish destroyed by them was not large in comparison with the former destruction in other parts of the bay. Since the Chinese began operating last fall three or four boats have fished intermittently and the total catch is running about 350,000 pounds per year, which is but little over a third of what the markets took before fishing was stopped in 1911. The boats fish now only when the tides are most favorable and when the shrimps are plentiful. It does not pay them, they say, to fish when the catches are small. Formerly the profit was principally in the dried shrimps and the larger ones were screened out and sold fresh as a side issue. The price obtained now for the fresh shrimps is the same as then—6 and 7 cents per pound—although the operating cost is much greater on account of drying operations being cut off.

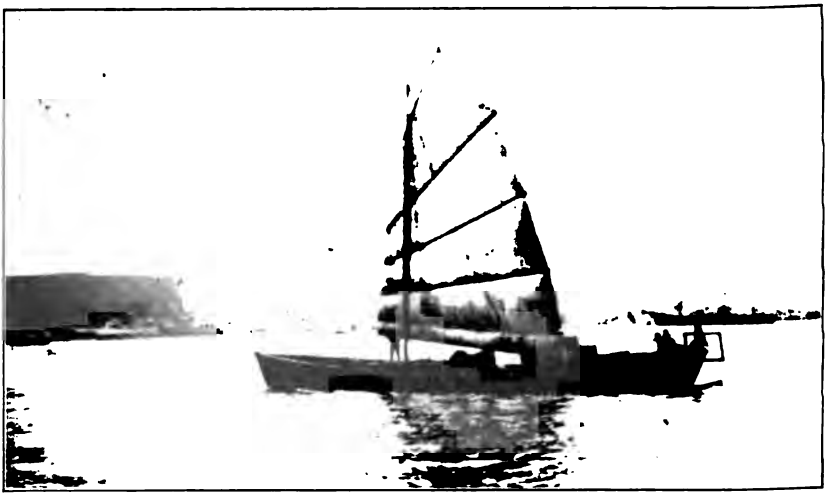


Fig. 56. Chinese shrimp fishing junk on San Francisco Bay. Photograph by H. B. Nidever.

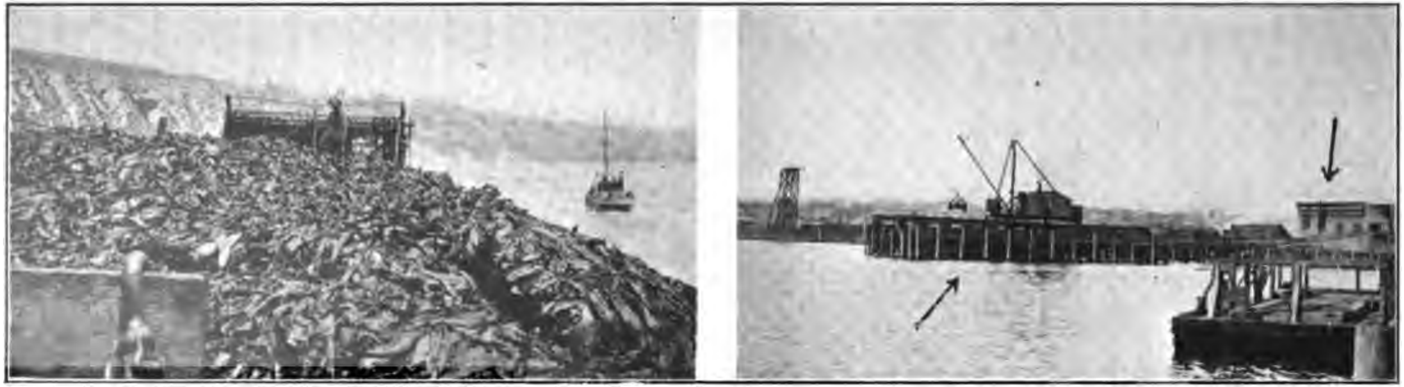


Fig. 57. Barge load of kelp ready for removal to reducing plant. Hopper for receiving kelp from cutter, plant of Swift and Company, San Diego. Photographs by H. B. Nidever.

Kelp.

The cutting of kelp along our coast for the potash contained therein is a new and very large industry which has sprung up within the last two years. The immense beds or groves of kelp are all within three miles of the shore and come under the jurisdiction of the state. At the 1914–1915 session of the legislature the State Fish and Game Commission was given the same supervision over the kelp and other marine plants that it has over the fish and game, so that it will be the duty of the Fish and Game Commission to enforce any state laws that may be passed for the regulation or conservation of the kelp industry.

It has long been known that the kelp along the Pacific coast contained a high percentage of potash. Considerable experimenting has been done to find methods of gathering the kelp and extracting the potash and other by-products that are commercially profitable.

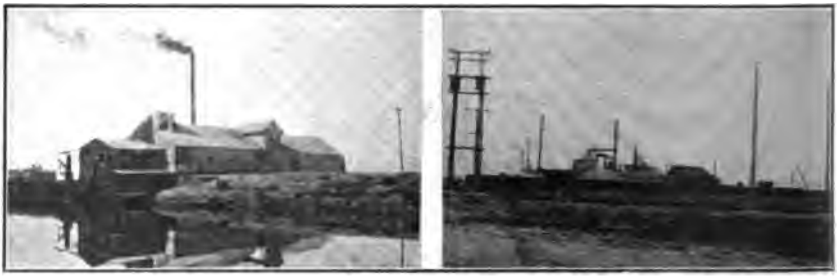


Fig. 58. A fish reduction plant for the manufacture of fertilizer, and a kelp reduction plant, at Long Beach. Photographs by H. B. Nidever.

The main source of our potash supply has been Germany, where deposits in what were ancient lakes or seas are found. The United States Department of Agriculture, realizing the importance of having a source of supply of our own and wishing to encourage the greater use of potash as a fertilizer to increase our crops, started an investigation of our kelp beds and conducted experiments in extracting the potash. The results of these investigations are to be found in Report No. 100 of the United States Department of Agriculture.

The beds of kelp which can be profitably harvested in California are all of them along the southern coast of the state, mostly south of Point Concepcion. Immense beds are also found along the peninsula of Lower California in Mexican waters.

The kelp is very largely composed of water and to profitably extract the potash large quantities will have to be handled. It requires a great outlay of capital for a company to embark in the enterprise. The high price of potash caused by the war has been such an inducement that several large companies have built plants at Long Beach and San Diego and are now beginning to harvest the kelp, confident that there is a sufficient supply, even though many may engage in the same industry.

At the present time there are four companies operating at San Diego, five at Long Beach and one near Wilmington. There are also several other factories being constructed at San Diego and Long Beach. Already three million dollars has been invested in the plants in southern California. Sixteen large reapers are employed, which have an average capacity of 200 tons each per day. The larger of the companies now operating are: The Hercules Powder Company, at National City; Swift Packing Company, San Diego; American Products Company, Long Beach; and The Diamond Match Company, at Wilmington.

There has been considerable uneasiness as to what effect the cutting of kelp will have on the fisheries of the state. Many fear that the cutting will destroy the beds and thus the protection which the kelp affords the beaches will be removed and that the clams which inhabit the beaches and the spiny lobsters which live more or less within the protection of the kelp will be greatly injured. Also that the young fish, especially the young barracuda, which are in the habit of seeking a refuge in the kelp, will be deprived of this refuge and will leave that part of the coast. It is also believed by many that the kelp beds are extensively used as spawning places for many of our commercial fish; that they attach their eggs to the kelp and that if the kelp is removed these eggs will be destroyed.

These beliefs are almost entirely groundless. Members of the Scripps Institution for Biological Research at La Jolla, employed by the government in its kelp investigations, are still engaged in watching the effect of cutting by the several large companies located there. It is their opinion that these companies are not likely, at least within the next several years, to devise kelp cutters or reapers which will cut the kelp more than six feet below the surface of the water. It has been observed that after one of these reapers has passed over a bed cutting the kelp to a depth of six feet that the kelp floats to the surface and it is difficult to even tell where the cutter has been. At the worst, there will be much of the kelp, especially along the edges of the beds, that will not be touched and which will afford protection to the beaches. It has been pointed out that where great masses of kelp grow in beds a violent storm detaches the plants from their holdfasts and the whole mass is carried away, thus leaving the beach unprotected. It is believed that where beds have been subjected to cutting that they will not be washed out by storms and will be a better protection to the beaches. Further, the kelp will still be a refuge for fish, even if it is cut six feet below the surface. It will also be a refuge for crawfish. Few or none of our commercial fishes spawn in the kelp beds.

The species of kelp which is being harvested in California is the *Macrocystis pyrifera,* which grows in long strands, from one to three hundred feet in length, and is held to the rocky bottom by means of a holdfast. The leaves float out on the surface of the water and are held suspended by floats specially designed for the purpose. The plants reproduce by spores, which lodge at the bottom, and start new plants, and also by stooling or sending off branches from the stock near the holdfast. If the top end of a plant is cut off, the rest of that particular stalk ceases to grow, but the shorter branches, which are continually arising from the base, soon grow up and take its place. Experiments are now being conducted at La Jolla for the purpose of determining the rate of growth of these plants and it is believed that the cutting of the kelp near the surface will tend to make them stool so that the growth will be increased by the cutting.

The companies engaged in the cutting of kelp are all large companies of proved business integrity and it is to their advantage not to destroy the kelp beds, but to conserve them and cut them only as fast as they will reproduce themselves.

It is the desire of the federal government that the state enact laws under which kelp beds may be leased or apportioned to operating companies and under such regulations that the beds will furnish continuous crops.

It was believed by those who investigated the California beds under the direction of the United States Department of Agriculture that there was enough kelp from Point Concepcion to the Mexican line to supply annually, without injury to the beds, all the potash used in the United States. The amount used annually before the great war cut off the supply from Germany was 300,000 tons, which, at antewar prices, was worth $15,000,000. The cutting has now progressed until a few of the beds have been cut over once and it has been determined that they are not producing the quantity estimated in the survey. This shortage may be as much as 50 per cent. It is believed that one reason of this is that since the survey was made storms have reduced the beds and they have not yet had time to reestablish themselves. The kelp harvesters or reapers that so far have been devised fail to pick up much of the kelp that is cut. This fault is overcome to a certain extent where one reaper follows the other and picks up what is left. There has been a good deal of complaint that the reapers cause large quantities of kelp to drift onto the beaches, where it smells badly and causes flies to accumulate. In most cases where an investigation was made, the kelp on the beaches was made up of the whole plants which had been torn from the bottom by the high tides and rough water. However, the whole kelp problem needs to be thoroughly investigated and in the meantime such regulatory laws as are obviously necessary should be passed.

OUR UNDEVELOPED FISHERY RESOURCES.

With few exceptions our sea fisheries have not been developed to their full capacity. By proper conservation they can be greatly extended. The fisheries can be more readily developed by educating the public in the use of fish and by improving the methods of handling, especially in inland towns. This work properly belongs to the State Commission Market, but we expect to assist by getting out educational bulletins containing descriptions of the different varieties of fish, how and where they are caught and when they are in season, with recipes for cooking. In other words, to develop the fisheries and reduce the cost of fish by creating a greater demand. This has been done in a few instances by private parties, as in the case of the California sardine and the albacore. There was no demand for either of these fish until they were placed before the public in a clean and appetizing form and the public educated to their use by advertising. Within a period of five years these two fish sprang from unimportance to a position of the highest rank. The albacore has assumed first place among our fisheries and the sardine is crowding the salmon for second place. What has been done with these two fish by private parties can in a measure be done with others with encouragement and assistance from the state. It is more properly the duty of the state to investigate and develop its fisheries than it is to investigate and develop its agricultural resources, for the fish are peculiarly the property of the people. We have several species of good food fish in almost unlimited numbers which are little used. A few of the important ones are the herring, anchovy, hake, shark and squid.

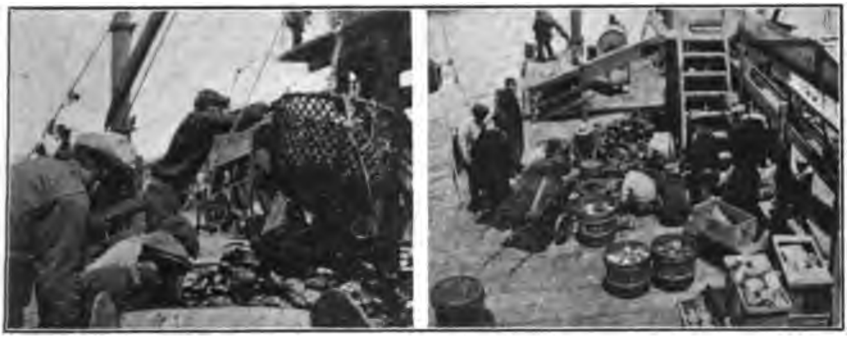


Fig. 59. Unloading and sorting abalones at Monterey. Photographs by H. B. Nidever.

Our shell fisheries are neglected and if properly conserved may be greatly extended. We have many extensive sand beaches where the Pismo and razor clams will flourish if they be but planted there. The soft-shell mud clam, originally introduced from the Atlantic coast, is suited to many bays and mud flats where it has not yet been introduced. On the Atlantic coast great advances have been made in "farming" the soft-shell clams and they are being raised on beds where they do not naturally establish themselves, by removing the young "spat" from beds where a good "set" has been made and sowing them like grain on these barren beds. The production of clams can be increased by this method almost without limit. As there is a most excellent market for these clams such an increase in production would be very desirable. In order to raise clams, or oysters for that matter, it is necessary to protect the beds from the depredations of the sting-rays with stake fences. No advance can be made in the cultivation of clams unless individual fishermen can control their own beds. The law on the subject should be thoroughly investigated to see if it is not possible under the Fish and Game Districting Act, or otherwise, to apportion beds to fishermen.

Recent great advances in oyster culture in the state of Washington make it certain that similar progress can be made here. Our production of oysters should be on the increase instead of remaining at a standstill. Our oyster and clam resources need to be thoroughly investigated by an expert and the ways and means pointed out for developing this neglected industry. Over 25 years ago C. H. Townsend made a report on the oyster resources of California for the United States Bureau of Fisheries. This report may be found in the 1893 report of the United States Commissioner of Fisheries. It was the result of a preliminary scientific survey of our oyster resources and the author was decidedly of the opinion that our oyster production could be greatly increased, and, even at that early time, complained of the antiquated methods pursued in the industry. Since that time we have made little improvement and no oyster expert has since visited our oyster beds, although the Bureau of Fisheries has several such who have been of invaluable assistance to oyster growers on the Atlantic coast. This has not been a case of neglect, for the truth is we have not asked them to come, as the industry has not been awake to the importance of oyster investigation work.

We have a sea mussel that abounds along nearly our entire 1000 miles of coast, clinging to the rocks in compact masses. In many places it is extremely abundant. These mussels have a food value equal to that of oysters. They are most excellent when canned or pickled. They grow more rapidly than oysters and the weight of the shell compared with the meat is much less than in oysters. All that is lacking is an inclination on the part of the public to eat them. They are eaten extensively in Europe, where in many places they are cultivated on barriers set up for the purpose.

On our Atlantic coast there is a mussel almost identical to ours, for which the United States Bureau of Fisheries is at the present time endeavoring to create a demand. There is some difficulty on the Atlantic coast in inducing the public to eat the sea mussel, for the Indians for some reason shunned it, preferring the mud clam, of which there was plenty. On our coast there can not be this prejudice, for the Indians along our entire coast subsisted mainly on them. There is an almost unlimited supply of these mussels and if it becomes necessary the production can be increased. We have, besides the large sea mussel, two species of smaller mussels that are found in the quieter waters of the bays and in estuaries at the mouths of streams. These species are occasionally found in the markets. We expect to start an educational campaign to induce the people to make use of these valuable shellfish.

Fig. 60. Point Lobos Abalone Cannery. Cleaning abalones at Point Lobos Cannery. Photographs by H. B. Nidever.

Recommendations.

We recommend that our system of taxing the fisheries be revised. Under the present system the revenue is derived from market fishermen's licenses, wholesale fish dealers' licenses and from fines imposed. The annual revenue from these licenses is about $40,000, which is not nearly adequate to cover the present expense of commercial fisheries patrol, propagation of commercial fishes and investigation work. A market fisherman now pays ten dollars a year and a wholesale fish dealer pays five dollars per year. Under this system the poorest clam digger pays double the license paid by the largest wholesale dealer or canner. The tax on dealers is ridiculously small, while ten dollars is too much for many of the fishermen. California is behind the other states and other countries in the matter of taxing its commercial fisheries and the main reason our fisheries have not advanced more rapidly is that the state has not had sufficient money for its commercial fisheries work. The system employed in Oregon, Washington and Alaska, as well as in most of the Atlantic states, is to tax the fishermen according to the apparatus they use and the canners, packers and wholesale dealers according to the amount of fish they handle, and where oyster and clam beds are controlled by individuals the beds are taxed according to their yield. This system is more just and equitable and will yield a larger revenue. With an increased revenue we could do much that at the present time we are not able to do. In southern California, which now leads in the importance of its commercial fisheries, we need at least two good seaworthy boats for patrol and investigation work. These boats should be equipped with hoists for the use of dredges, trawls and pelagic nets and each should have a man in its crew who has had sufficient scientific training to enable him to carry on investigation work under the direction of a competent central head. We need to complete the investigations begun on the spiny lobster and edible crab and to conduct experiments on propagating these two species as well as to propagate certain forms of marine fishes, the artificial propagation of which has been carried beyond this experimental stage in other places. We need to investigate and learn all we can of the habits and life history of the albacore and other commercial fishes, for we know little about any of them. Furthermore, we should have a thorough investigation of the kelp industry and of the effect of cutting the kelp beds. We need also a biological survey of our coast and of our streams and lakes. All of the above could be done and our commercial fisheries thereby be greatly benefited.

Respectfully submitted.

(Signed) N. B. Scofield,
In Charge, Commercial Fisheries.

REPORT OF BUREAU OF EDUCATION, PUBLICITY AND RESEARCH.

The Honorable Board of Fish and Game Commissioners
of the State of California.

GENTLEMEN: We have the honor to submit herewith the first biennial report of the Bureau of Education, Publicity and Research, covering the period from the institution of the bureau in September, 1914, to the end of the fiscal year 1915–16.

Organization.

At a called meeting held in San Francisco on July 5, 1914, your honorable board unanimously passed a resolution embodying the institution of educational and publicity work to be carried on by a suitable assistant who should be given the title of Game Expert and placed under civil service. In September, 1914, the present director assumed temporary charge of the new bureau and later qualified under civil service. A definite scheme of operation was immediately worked out and the bureau has followed in a general way the original plans laid down. The work accomplished has naturally been limited, owing to the fact that the duties fell upon one individual. An office was established at the Museum of Vertebrate Zoology at the University of California, where opportunities for undisturbed work and library and museum facilities were of the best. With the permission of your board the head of the bureau continued to hold a position with the University of California as Economic Ornithologist.

As the name of the bureau signifies, the work is of three kinds: education, publicity, and research. This report therefore will fall under these three headings.

Education.

Salisbury Wild Life Pictures. During the fall of 1914 the Fish and Game Commission cooperated in displaying throughout the state the Salisbury Wild Life Pictures. These films were obtained by E. A. Salisbury, director of the Educational Film Company of Los Angeles, in southern Oregon and northeastern California. In that the pictures illustrate the life histories of some of the common game birds and mammals of the state of California and vividly portrayed some of the fundamental aspects of wild life conservation, the commission felt justified in giving them support. For several weeks in the fall of 1914 the Director of the Bureau of Education, Publicity, and Research, traveled about the state giving lectures with these pictures and emphasizing wild life conservation. On a single trip alone in the San Joaquin Valley, over 10,000 people saw the pictures and heard the lectures.

The success of these films in eastern states and the comments upon them received from conservationists, have fully justified the effort made by the commission to place them before the people of this state.

Lectures. More than one hundred illustrated lectures have been given by this bureau in various parts of the state. These have advertised the wild life resources of California and have carried the message of conservation to farmers' organizations, women's clubs, Audubon societies, high schools, grammar schools, and boy scouts.

Fig. 61. Young mountain lions. From Salisbury's wild life pictures. (Courtesy Mr. E. A. Salisbury.)

A series of lectures was given during the spring semester of 1915 and again in 1916 in a course in advanced vertebrate zoology in the University of California, the students of which are prospective teachers. Several lectures were also given in a zoology course based largely upon the animal life of Berkeley and the Bay region. Through the cooperation of the forestry department of the University of California, a series of six lectures on game and game conservation was given during the spring semester of 1915 in a course on forest protection. These lectures reached many outsiders in addition to the fifty students registered in the course, for the series was open to the public. During the spring semester of 1916, a similar series of nine lectures was given before the 350 registered students in a course on general forestry and the many outsiders attracted by the publicity given the lectures. It is peculiarly fitting that forestry students in California should have a fundamental knowledge of wild life, for many of those entering forest service work in this state will become game wardens by virtue of their positions. The success of these series of lectures is in a measure due to Professor Walter Mulford, head of the Department of Forestry, who encouraged the institution of cooperative work, and to Dr. J. Grinnell, N. B. Scofield and T. I. Storer, each of whom assisted by giving one or more of the lectures. The results attained show that the subject of fish and game is of such general interest that a full course on fish and game given in the state university under the direction of the bureau would be productive of valuable results. With the incentive that such a course would give, many forestry students might become sufficiently interested to take up work as game wardens, and many university students would receive sufficient knowledge of game and game conditions to make of them valuable allies of game conservation.

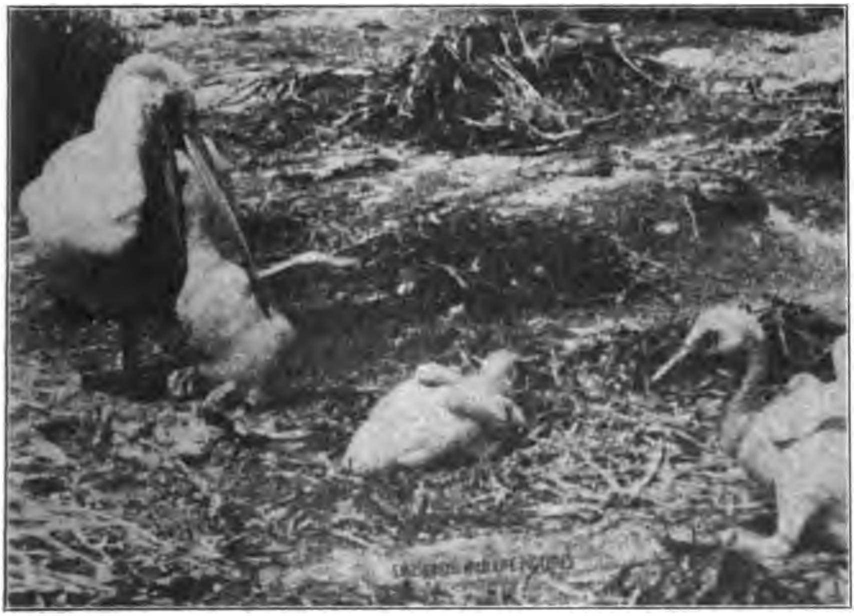


Fig. 62. White pelican feeding young at Clear Lake, Modoc County. From Salisbury's wild life pictures. (Courtesy Mr. E. A. Salisbury.)

In helping to make the students of our state university more familiar with our fish and game resources, we believe that we are carrying on fundamental work which will show abundant results in the future. University students have the opportunity to leaven the public sentiment of this state as regards wild life conservation, as no other group of citizens.

Recognizing that the understanding and sympathy of the child is fundamental to the successful attainment of the conservation measures of the future, effort has been directed toward the stimulation of nature study in the public schools. It has been found that, although nature study is a compulsory subject in our public schools, there are few places in the state where any pretense of adequately teaching this subject is made. In order to demonstrate the possibilities involved in work of this kind, the Director of the Bureau of Education, Publicity, and Research, addressed a meeting of teachers, and conducted several field trips in Sacramento. Classes of fifth graders were taken to the city parks and to the outskirts of the city, and were taught the names and habits of the different forms of life encountered. Partly as a result of this endeavor, nature study and trips afield have been permanently established in the public schools of Sacramento. It is hoped that other cities will soon recognize the value of teaching children to "read a roadside as they read a book," and will institute similar work. The ultimate goal, of course, is to have nature study supervisors in every city in the state, each with planned courses of study which shall include field trips where children may learn to study wild life at first hand. To this end proper training of prospective teachers is fundamental. When teachers are asked to take up nature study they either complain that they have not had the training to fit them for the work, or that no material is available. The attempt therefore is being made to stimulate interest in this phase of education in our normal schools, universities, and colleges, and to furnish, in the form of leaflets and bulletins, material which will be useful to such teachers.

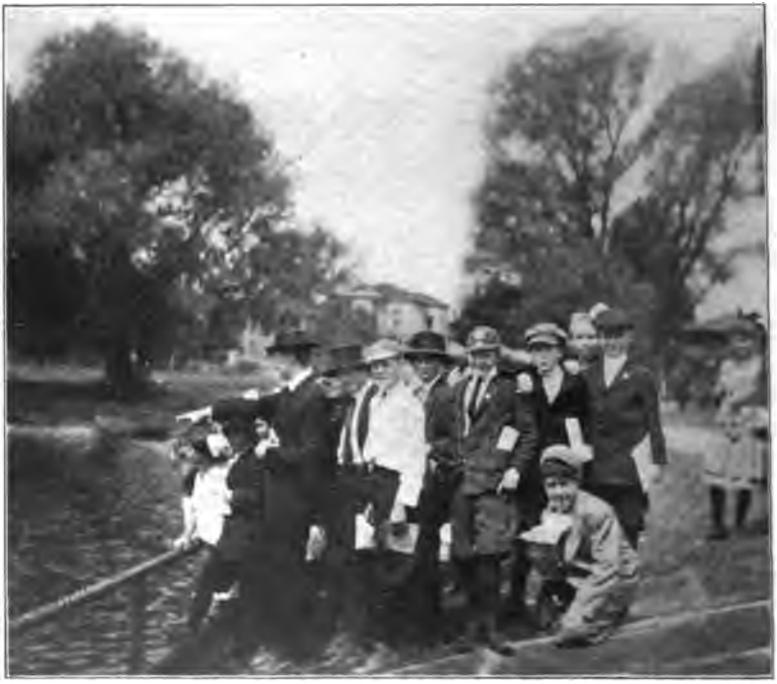


Fig. 63. Fifth graders of Sacramento public schools being taught the fundamentals of game conservation at Southside Park, where many waterfowl are to be found on the lake. Photograph by H. C. Bryant.

Outlines for courses of study in game resources and conservation methods have been prepared for women's clubs, boys' agricultural clubs and boy scout organizations. These will soon be available for distribution.

Boy scout cooperation—Believing that the boy scout is in a position to aid materially in the enforcement of fish and game laws and in the care and conservation of wild life, a cooperative arrangement has been instituted which will be of value to both the scouts and the commission. By cooperating with the commission the scout not only becomes a better citizen but prepares himself for the merit badge in conservation, requirements Nos. 2, 4 and 6 of the manual particularly specifying this kind of work.

Credit will be given boy scouts for the following types of work:

1. The dissemination of knowledge on the fish and game laws, the work of the California Fish and Game Commission, and on wild life conservation. (It would be of great aid to the commission if boy scouts would always take the opportunity to inform campers, hunters, and others with whom they come in contact, of the fish and game laws, warn them of their liability for violation of these laws, and report all violations to the nearest game warden.)
2. The finding and reporting of wild game which has been injured or destroyed in numbers either through natural or artificial means.
3. The systematic feeding of game during severe winters, or the encouragement of wild birds through feeding, the planting of cover, or the building of nest boxes.
4. The taking of a census of any one game species in a restricted area.
5. The destruction of predaceous animals injurious to wild life or the destruction of that worst of bird pests, the European house sparrow, usually called English sparrow.

In return for cooperation, the commission will award a prize (or prizes if necessary) of a pair of golden pheasants to the boy scout who does the most cooperative work. Scouts wishing to qualify for the above prizes are to report regularly on the work accomplished. If sufficient interest is shown in fish and game cooperative work a merit badge will be offered later by the commission.

To stimulate interest in this cooperative work and to interest scouts in game conservation a series of illustrated lectures and a series of field trips for the boy scouts in the Bay region is being planned.

Publications. The series of teachers' bulletins prepared by Miss Gretchen Libby while Educational Assistant of the Fish and Game Commission, have been in great demand, as has also her bulletin entitled "Bird study in the public schools," our supply of which is now exhausted. To augment the supply of printed matter for teachers, several articles have been published in CALIFORNIA FISH AND GAME designed mainly for their use, and teachers' bulletins No. 6, entitled, "Bats as Desirable Citizens," by J. Grinnell, and No. 7, entitled "The Control of the House Sparrow in California," by H. C. Bryant, have been added to the bulletin series for the use of teachers. The Bird and Arbor Day Manual for 1916, issued by the Superintendent of Public Instruction, contained several articles furnished by this bureau dealing with the wild life resources of the state, and with suggestions as to how these resources may be presented to pupils in the schools.

In order that those contributing to, and interested in, the conservation of wild life in California might receive direct information from the commission administering the wild life resources, the publication of a quarterly illustrated magazine entitled CALIFORNIA FISH AND GAME was begun. The motto chosen for the publication was "Conservation through education." The first number appeared in October, 1914. The October number, 1915, completed volume 1, a volume containing 261 pages and 58 illustrations. The departments regularly appearing were general articles, editorials, hatchery and fishery notes, conservation in other states, life history notes, wild life in relation to agriculture, and reports. The editor has taken pains to select only authentic contributions for publication and has eliminated as far as possible the imaginative and hearsay tales which so often appear in like periodicals. Such sentiments as the following have been editorially expressed in the magazine: the effectiveness of game preservation is governed by the interest of the people, and the spirit of those who hunt and fish; the recognition of scientific truths combined with a practical knowledge of the working of correct laws are essential things in the working of game administration; accurate statistical information is the one essential foundation upon which protective legislation must rest; nothing can be of more value to the cause of game protection at the present time than a systematic campaign of education conducted officially by the game department in every state in the Union. The second volume of CALIFORNIA FISH AND GAME, two numbers of which have already appeared, will surpass the first volume in the character of the illustrations and in the articles published. The periodical is sent to citizens of the state who make application, and to game departments and interested parties in other states. The demand for this publication has proved to be so great that the first editions numbering five thousand became inadequate, and later editions had to be materially increased. Nor does the information contained in CALIFORNIA FISH AND GAME reach only those to whom the magazine is sent; for newspapers regularly copy articles printed therein. More than seventy-five newspapers copied articles from the October, 1915, number.

Several public hearings have been held under the auspices of this bureau. Through meetings of this kind the commission is able to obtain an expression of public sentiment exceedingly valuable in the administration of game laws. Free discussion of the points at issue has in each instance resulted in a better understanding between the hunter and fisherman, and the commission (see Fig. 64).

Fig. 64. Interested listeners at a hearing on salmon and trout, held at Santa Rosa, February 9, 1916. Photograph by H. C. Bryant.

Publicity.

The bureau has relied largely on CALIFORNIA FISH AND GAME as a medium of publicity, but further efforts to gain publicity for the state's game resources and the work of the commission have been made. A series of twenty articles on "California Game Resources" was furnished the San Francisco *Call and Post*. This series dealt with various game fishes, birds, and mammals of California and the distribution, recognition marks, habits, status, and value of each for food and sport, was given. This series of articles was simultaneously published in the Los Angeles *Herald* and subsequently in about twenty other newspapers. The bureau stands ready to furnish any other newspaper with a similar series of articles. The bureau has also kept in touch with such central news agencies as the Associated Press and United Press, and numerous mimeographed news letters have been sent to all of the newspapers of the state. Evidence of the effectiveness of the news-letter plan of publicity is evident from the results of the campaign against the English sparrow. A news-letter giving details of the contemplated control of the sparrow sent to each newspaper resulted in the appearance of the item in more than 180 different newspapers. A follow-up news-letter on the same subject was also widely used. In many instances photographs and cuts have been loaned to newspapers and magazines.

This plan of conducting newspaper publicity by gathering and sending out news items from a central office is undoubtedly the most effective and desirable method of gaining publicity, and should be more largely followed in the future. Its advantages are that it allows of a wider circulation of the publicity item and of a closer and wiser censorship than is otherwise possible.

Research.

Careful attention has been given to the gathering and filing for reference of data on the game birds and mammals of the state. Many letters asking for information have been sent out and the district offices have cooperated by sending in useful information. The most detailed reports so obtained have been on the mourning dove, ring-necked pheasant, and beaver. A collection of photographs is also being accumulated. As a result, the bureau in time will have in its possession an invaluable photographic record of the present status of game and of the work of the Fish and Game Commission.

An attempt to increase interest in the fur-bearing mammals of the state has been made in the study of the fur trade in California, published under the title, "California's Fur-bearing Mammals." An historical survey demonstrated the decreasing worth of a once valuable resource, and the great need for legislation which will give complete protection to certain species and protection to all fur-bearers during the time when their fur is of no value. If the state of California wishes to conserve her fur resources, make them a source of income, and a heritage to pass on to future generations, she must fall in line with other states and better protect fur-bearing mammals.

A tabulation of the number of deer killed in the open seasons of 1914 and 1915 has been made. The reports of deputies and of forest officers showed that a total of 8,699 deer were known to have been killed during 1914, and a total of 8,343 in 1915. The fact that many deer killed are not reported by deputies and forest officers leads to the conclusion that at least 12,000 deer were killed during the open season of each of these years.

An attempt to obtain information in regard to hunting accidents in the open season of 1915 showed eight men to have been killed because they were mistaken for game, nine men to have been severely wounded, and seven to have been killed by the accidental discharge of a gun while hunting. The reports of accidents were necessarily incomplete, but they were sufficient to vividly show the criminal carelessness exhibited during each hunting season. It is important that the hunting fraternity understand that there is nothing accidental in the results attained when an object, the identity of which is in doubt, is fired upon.

In furtherance of the investigation of the food habits of nongame birds instituted in 1911, a study of the food of the roadrunner has been completed and a full report is in press. Eighty-three stomachs were examined and the contents identified. The results of the investigation have not sustained the oft-repeated accusation that the roadrunner is a destroyer of the eggs and young of valley quail. Although young birds are occasionally taken as food, there is no evidence that quail are preyed upon to the exclusion of other small song-birds. (See Fig. 66.) The bulk of the food of the roadrunner is made up of insects, especially beetles, grasshoppers, crickets and caterpillars. Lizards and snakes and mice comprise the larger part of the vertebrate food taken, but small birds are sometimes eaten (see Fig. 66). One

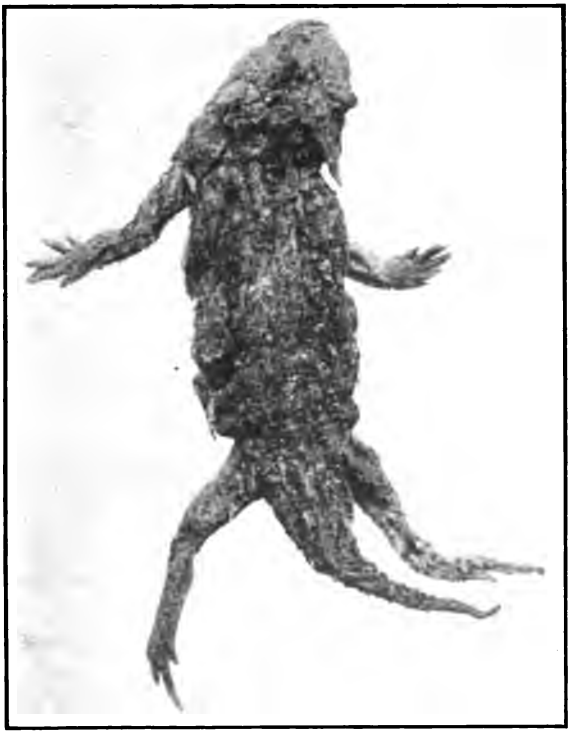


Fig. 65. A Blainville horned toad taken from the stomach of a roadrunner. Photograph by H. C. Bryant.

outstanding feature of the diet of the birds examined was the preponderance of one kind of vegetable food—the fruit and seeds of the sourberry, *Rhus integrifolia.* Large numbers of cicadas and several scorpions had been eaten by the birds. The roadrunner's relationship to the cuckoos is emphasized by its fondness for hairy caterpillars, many of which had been eaten. The lack of evidence as to the roadrunner's attacks on valley quail, plus the benefits conferred by it in the destruction of insect and rodent pests, plus its esthetic value, leave a balance distinctly in favor of the bird and make it a beneficial rather than an injurious species.

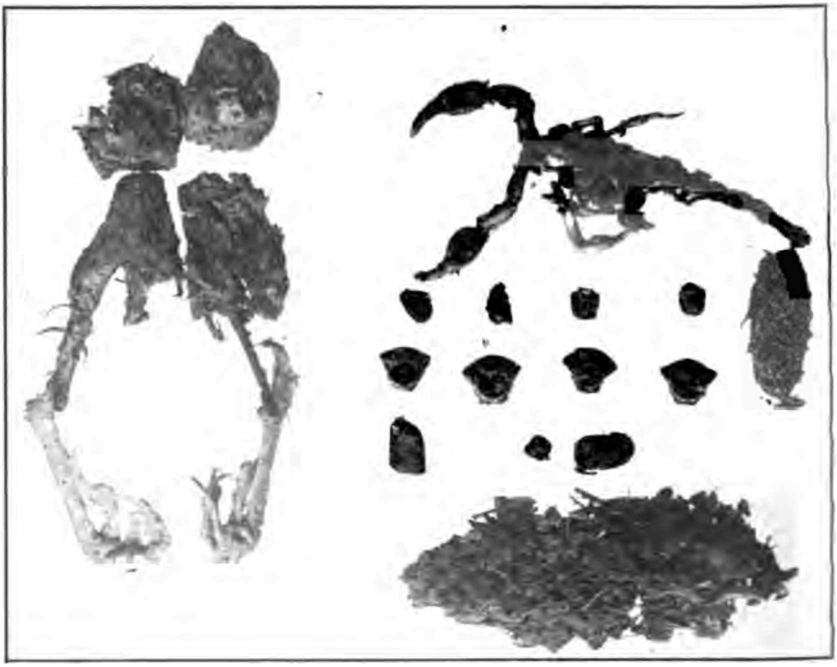


Fig. 66. Stomach contents of roadrunner, showing remains of an Anthony towhee, a scorpion and parts of several cicadas. Photograph by T. I. Storer.

A study is being made of the food of ducks in this state, with a view to the increase of the available food supply by artificial plantings and the furnishing of a means of attracting waterfowl. A large number of duck stomachs is at hand and many of these have already been examined and the contents of each recorded.

A study is also being made of attempts to acclimatize foreign game birds in California, with a view of discovering the reasons for success and failure, and of what may be expected from future trials. After a review of the history of the introduction of exotic species, it is quite evident that the results have not been proportionate to the money and energy expended. Two of the principal causes of failure appear to be the lack of careful investigation of the inherent factors limiting acclimatization and of the method of liberation. The successful establishment of a species has been found to be possible under favorable conditions, and ultimate success in acclimatizing foreign species therefore lies in careful experimentation. But though acclimatizing game birds is a possibility, it is an open question whether it is desirable to supplant native species with foreign ones. The native fauna is usually the most desirable, and the result of our finding seems to show that California should take a stand with other states in protecting her native game rather than attempting the introduction of foreign species. The valley quail is a better game bird than the pheasant or any other foreign species. Concentration on methods of conserving this bird is, therefore, more important than futile attempts at acclimatization. In the increasing stocking experiments carried on by individuals great encouragement may be found. Many people now successfully propagate quail in captivity and liberate the increase.

The present status of the beaver in California, according to data gathered in this office, is precarious. Colonies of this valuable furbearer are few at the present time, and give promise of becoming even more scarce. The Hudson Bay Company, when operating in California, beginning in 1828, secured thousands of beaver skins each year, and thereafter considerable numbers were taken each year by trappers. Since 1911, however, it has been necessary to give total protection to this animal, but even thus protected beavers do not seem to have increased to any considerable extent. The few scattered localities in which colonies are now to be found are shown on the accompanying map (Fig. 67). In the San Joaquin and Sacramento river basins, where beaver are most abundant, reclamation projects are fast driving them to starvation, or to more limited quarters. The total extirpation of the beaver in California is not far distant unless further measures are taken for its protection. The bureau plans to show the present status of many other game birds and mammals by means of distribution maps similar to that giving the distribution of beaver.

Considerable complaint that blackbirds damage rice has been received by the commission. Investigations show that the complaints are well founded. Some sort of control measures should be instituted and further investigations leading to the discovery of some practical method of meeting the situation are planned.

The chief forest deputies of the national forests of this state report annually to the commission the game conditions in their districts. These

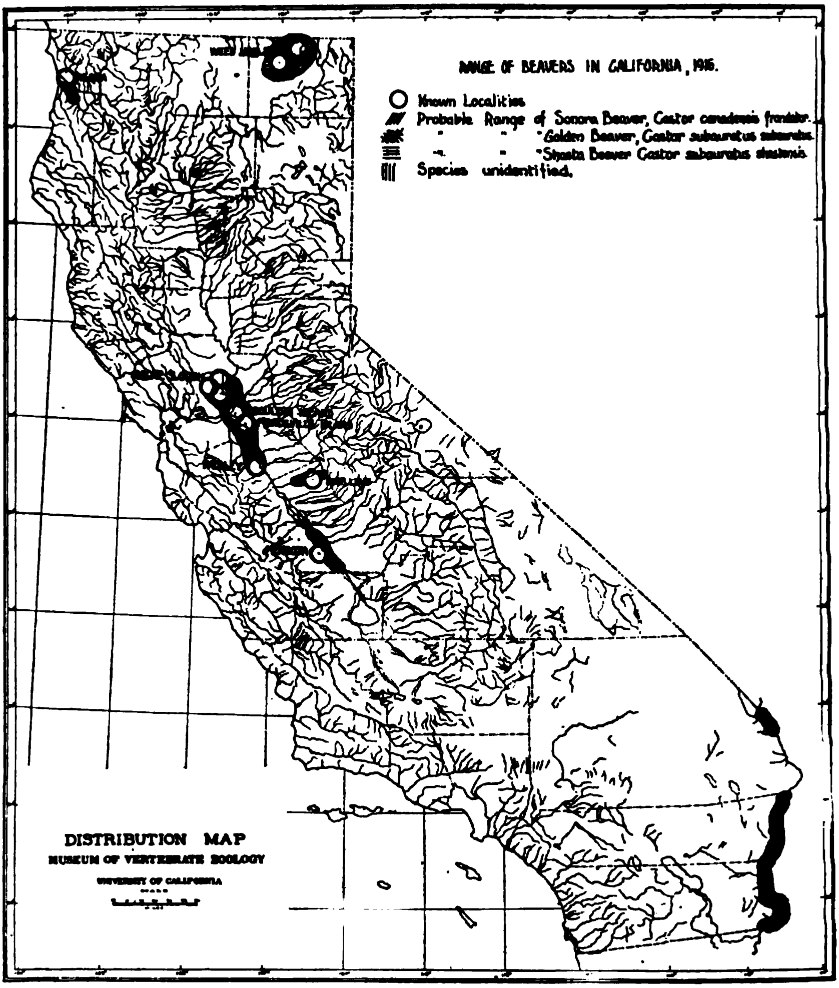

RANGE OF BEAVERS IN CALIFORNIA, 1916.
Known Localities
Probable Range of Sonora Beaver, Castor canadensis frondator.
" " "Golden Beaver, Castor subauratus subauratus.
" " "Shasta Beaver Castor subauratus shastensis
Species unidentified.
DISTRIBUTION MAP
MUSEUM OF VERTEBRATE ZOOLOGY
UNIVERSITY OF CALIFORNIA

Fig. 67. Map showing distribution of beavers in California in 1916. Although once very numerous, few beavers are to be found at the present time.

reports afford much valuable information on the life history and status of the various species of game birds and mammals. Such items as demanded immediate attention have been investigated, and much of the information contained in the reports has been utilized.

A book on the game birds of California, in preparation under the auspices of the University of California Museum of Vetebrate Zoology, under the joint authorship of Dr. Joseph Grinnell, the director of this bureau, and Mr. T. I. Storer, is almost ready for the press. Although the routine work of the bureau has precluded continuous participation in the preparation of the manuscript during the past two years, all available spare time has been given to a furtherance of the project.

In addition to introductory chapters dealing with problems allied to the game birds of the state, full discussion of the distribution, life history and habits of every species of game bird found in California will be given, and the whole will be profusely illustrated. Whether the book is published by the Fish and Game Commission, or under other auspices, it should meet a long-felt need in that it will be serviceable to both the technical and nontechnical student, and will be useful as a sportsman's handbook.

In addition to the above researches, there have been a number of field investigations. The condition of the duck breeding grounds in the vicinity of Los Banos, Merced County, and Alvarado, Alameda County, were studied in 1915, with a view to determine the productive capacity of a given area of swamp land. A nesting colony of egrets near Crows Landing, Stanislaus County, was visited, as were also beaver colonies at Mendota, Fresno County.

The above have been some of the outstanding features of the many activities of this new bureau. In conclusion, we believe that the Bureau of Education, Publicity and Research, has justified its existence by its accumulation and output of accurate information regarding the wild life resources of California, and that a further expansion of the work would promote the interests of wild life and of the commission concerned with its conservation.

Respectively submitted.

(Signed) HAROLD C. BRYANT,
In Charge Education, Publicity, and Research.

REPORT OF THE LEGAL DEPARTMENT.

To the Honorable Board of Fish and Game Commissioners

GENTLEMEN: I herewith submit to you a report of the work of the legal department of the commission for two years, ending June 30, 1916.

During this biennial period there have been many interesting legal matters which have come up in the work of the Fish and Game Commission. The period has been marked by the greatest number of cases ever made by the deputies of the Fish and Game Commission in any similar period of time. There has been more active help and cooperation from citizens than at any time in the past. In former years, it was practically certain that when a violator demanded a jury trial he would be acquitted, but at present in most parts of the state the chances are not greatly in his favor. In many instances jury trials have been won where the evidence was far from conclusive.

In July, 1914, in the District Court of Appeals in Los Angeles County, the case of *People* vs. *Mascola* came up on appeal. The attorney for Mascola contended that the Districting Act, which had been passed by the legislature in conformity with the constitutional amendment of 1902, was unconstitutional in that it prohibited the people of certain sections from doing that which was allowed in other sections. In the decisions handed down by the court the contention of the appellant was overruled but the title of the Districting Act of 1913 was declared faulty, and the act was set aside. In the decision it was also noted that laws must apply uniformly over each district and that it was not constitutional to except certain sections within the district. On account of this decision it was necessary to revise the Districting Act and to change many of the laws on the statutes. This was done at the 1915 session of the legislature.

One of the most difficult problems, and also one of the most important, that comes before the Fish and Game Commission is compelling canal owners to maintain fish screens in irrigating ditches and to construct and maintain fish ladders over dams. In many instances long and bitter litigation has been carried out.

Before fish screens that would operate under all conditions had been perfected, it was practically impossible to compel the installation and maintenance of screens. At the present time, however, screens have been developed that will operate under any and all conditions and there is not a canal in the state in which it would be impossible to maintain a proper screen.

During November, 1915, the canal companies owned or controlled by the Fresno Canal and Irrigation Company were notified that they would be required to screen their ditches in such a way that all fish life would be prevented from passing into the canals. After notice was given the companies through their attorneys, they demanded a hearing, as provided by the statute passed by the legislature in 1915. Hearings were held in Fresno during January of this year. The testimony showed that great numbers of fish found their way through the canals and were destroyed. Upon the evidence introduced at this hearing, the commission ordered the companies to install screens in the Fresno ditch, Riverdale ditch, Kings River ditch, the Fresno Canal Company's ditch, Consolidated Canal Company's ditch and the Fresno Canal and Irrigation Company's canal. The companies failed to conform with this order and complaints were sworn to in the Justice's Court of Fresno County, and are now pending.

Numerous hearings have been held under the provisions of the sections of the code relating to screens and fish ladders. In the majority of instances entirely satisfactory conclusions have been reached without it being necessary to resort to the courts.

In March, 1915, John C. Robbins, of Tehama County, an unsalaried deputy of the Fish and Game Commission, was arrested by Forest Ranger Harvey Abbey for killing deer during the closed season. Robbins demanded a jury trial, but was convicted and fined $150 by Justice Lennon of Red Bluff. The District Court of Appeals was asked for a writ of habeas corpus questioning the validity of the judgment of the Justice. The writ was denied and the judgment of the Justice's Court affirmed.

In April, 1915, Fred W. Robins, another unsalaried deputy, living in Santa Clara County, was arrested for angling without a license. He demanded a jury trial before Justice Simpson of Almaden; was convicted and sentenced to a fine of $50 and to serve ten days in jail. He appealed to the Superior Court, but this higher court affirmed the judgment of the lower court.

From time to time in the past it has been reported to the Fish and Game Commission that considerable numbers of striped bass were being shipped to various points outside of the state, in violation of the state law prohibiting the export of striped bass. In March, 1916, very reliable information was received and one of the deputies of the Fish and Game Commission was sent to Salt Lake to make an investigation. As a result of his investigations, A. Paladini was arrested on a number of charges and was convicted in the Police Courts of San Francisco, being fined $100. An appeal was taken and the case is still pending. At the same time a number of other charges were filed against Paladini. These are being held subject to the appeal in the case mentioned.

In November, 1914, Deputy George J. Rodolph, while engaged in patrol duties in the vicinity of Los Banos, attempted to arrest Len

Cisco and Earl Farnsworth for violation of section 626*n*. Cisco and Farnsworth resisted arrest and Rodolph was shot in the back after Farnsworth had been wounded by him. Rodolph died almost instantly. Both Cisco and Farnsworth were charged with murder. Cisco was discharged at the preliminary examination and Farnsworth held for the murder. He was tried in Merced in June and was acquitted by a jury. In our judgment the verdict was a gross miscarriage of justice. Rodolph sacrificed his life in the service of the state and should be enrolled among those to whom the state owes all honor.

During the early summer of 1915, the H. N. Welch Company, a corporation organized under the laws of the state of Utah, made several shipments of trout from Salt Lake City, Utah, to Los Angeles, that were not in accordance with the laws of the state of California. These shipments were seized by deputies of the commission. The Utah Company brought suit against the Fish and Game Commission in the United States District Court at Los Angeles and asked for an injunction restraining the commission from interfering in any way with shipments of trout, contending that the act was unconstitutional, citing numerous authorities in support of their contention. In June their motion for a temporary injunction was argued and denied. Later in the same month the whole action was dismissed. It was said that the Welch company would appeal to the Supreme Court, but this was never done.

This case was one of the most important that has come up in the history of the commission. If the complainants had been upheld in their contention, it would have been the most severe blow that could have been given to the game interests of the state, as it would have been necessary for the Fish and Game Commission to prove in every instance that the game or fish possessed unlawfully was not brought from without the state.

A number of prosecutions have been begun against oil and gas companies for polluting the public waters of the state and in almost all instances the evil has been remedied by the companies. In cooperating with the commission, companies have installed the latest devices to prevent future pollution.

This department has given many decisions interpreting the fish and game laws of the state, and has written hundreds of letters answering inquiries regarding the construction of the fish and game laws.

During the two fiscal years just ended, the number of arrests was 2,087 and the number of convictions 1,747, or $83\frac{7}{10}$ per cent convictions. The per centage of convictions for fish and game violations is higher than any other class of cases of like degree. In all instances of criminal violations of a particular class the imposition of punishment is measured by the sentiment of the people toward the enforcement of that particular class of laws. The large percentage of convictions in fish and game violations indicates most strongly the growing sentiment of the people toward conservation of the fish and game of this state and their strong desire for the strict enforcement of the laws pertaining thereto.

In a large percentage of cases fines are imposed and in some instances jail sentences without any alternative are inflicted on violators, which shows the increased cooperation between the commission and the justices of the peace in the enforcement of the fish and game laws.

Respectfully submitted.

ROBERT D. DUKE,
Attorney for the Board.

Dated: October 20, 1916.

REPORT OF FIELD AGENT.

The Honorable Board of Fish and Game Commissioners
of the State of California.

SIRS: With the closing of the fourth administrative district office, March 1, 1916, your honorable board established the former head of the Fresno Division in the position of Field Agent. The prescribed duties of the Field Agent were to represent the commission throughout the state, to correctly inform the commission of conditions affecting the fish and game interests in every portion of the state, and to supervise, in an advisory capacity, the activities of the deputies. It was believed that a Field Agent in circulating among the deputies would be of much assistance to them in solving their individual problems, in explaining the various rules and regulations of the board, and in bringing about a universal standard of efficiency throughout every section of the state.

The idea has been welcomed by the field force. Many deputies stationed in territory far removed from district offices have had small opportunity for receiving training and instruction as to how to satisfactorily comply with the rules and regulations regarding operations of field deputies. Very naturally, many problems arise in the daily life of the deputies which they find hard to solve according to the ideals of the commission, and to be able to confer on the ground with some official who can speak authoritatively, appeals to the deputies as a valuable privilege.

The general public too, apparently enjoys presenting its ideas to some one who can inform them of the commission's attitude and who, in turn, will directly carry the views of the public to the commissioners.

Among the investigations carried on have been the following: A market fisherman at Redding had been using a set-line for several years and had successfully defied the efforts of the commission to suppress his operations. A warrant was secured from the district attorney and the violator is now under bond. Oil pollution of the Sacramento River near Dunsmuir was investigated. Certain license matters have been adjusted with county clerks. Many forest service headquarters have been visited and the friendship existing between the Forest Service and the Fish and Game Commission cemented and better cooperative working conditions promoted. The commission has been officially represented at the meeting of the County Supervisors Convention, held at Redding, the Fresno Commercial Club and at several other conventions. Assistance has been given the Fresno Playgrounds Commission in the attempt to secure from the Forest Service permission to secure a playground site at Huntington Lake in the mountains of Fresno County. The initial plans of the Playgrounds Commission involve the taking of 5000 children into the high mountains annually. Furthermore, the Fish and Game Commission has been invited to instruct the children at the camp regarding wild life conservation.

A large section of the state has been covered, people met, complaints heard and information given regarding the activities of the commission.

The activities of the commission have been given publicity through a weekly column which has been edited in the San Francisco Bulletin.

The best work we have done, so far as we can judge, has been among the outside deputies. Their various problems have been solved or at least explained so that they can work independently. Each deputy with whom we have come in contact has been studied and an effort made to make him more useful to the state. The men all seem to be well pleased at the new order of things and they have gladly laid all their problems before us and have received our instructions with every evidence of appreciation.

It is the almost universal rule that the field deputies of this commission are very anxious to get results and to live up to the standards which the commission has set for them. The average deputy finds it hard to comply with various orders sent out by the head office in the manner expected by the commission. In justice to the deputies, account should be taken of the fact that the average patrolman who is in the field all day and has his mind upon his next day's work during his waking hours, is not in a position to do good work in the way of making reports and complying accurately with some of the orders sent to him. As a matter of fact, he often has small time to seriously study some orders which are to him a little unusual. We have been of material assistance to the fieldmen in showing them how to comply with such instructions.

Very naturally, the scope and importance of the work of the Field Agent will be enlarged and the value of the results accomplished can be judged to better advantage after the work has been under way a longer period of time.

Respectfully submitted.

(Signed) A. D. FERGUSON,
Field Agent.

REPORT OF SUPERINTENDENT OF STATE GAME FARM.

The Honorable Board of Fish and Game Commissioners.

GENTLEMEN: For the past two years the commission has been on the verge of abandoning the Game Farm. Difficulties with the owner of the land upon which the Game Farm is located, the fact that the commission feels that sufficient attempts to stock the state with pheasants have been made, and the general unfitness of the location for the work, each have contributed to this situation.

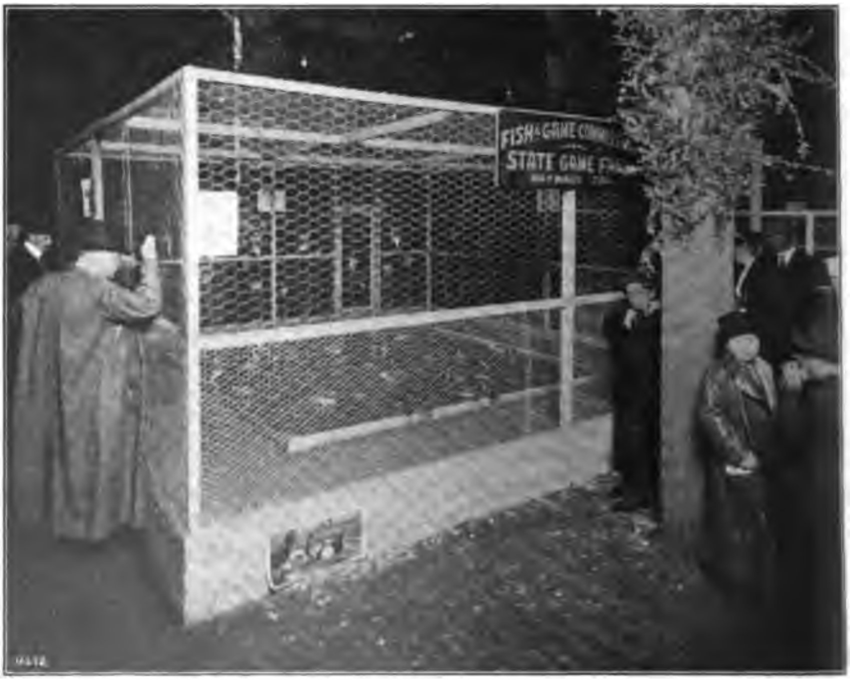


Fig. 68. Exhibit of State Game Farm at Children's Pets Exhibition, held at the Panama-Pacific Exposition, 1915. Photograph by Cardinell-Vincent Company.

Being unable to satisfactorily terminate the lease in 1915, your board decided to maintain the farm as an experimental station, devoting energy to the rearing of game indigenous to the state, such as valley quail, ducks and deer. Working under the above handicap, we have been unable to attain results which could have been attained under more favorable circumstances. Beginning with the fiscal year 1916, the surplus stock will be offered to breeders. Thus it is intended to make the Game Farm in a measure self-supporting.

Pheasants.

During the season of 1915, we had poor success with pheasants. Whereas a few broods did well and matured into fine birds, others were weaklings, more than half of which died during the first ten days. We can advance no reason for this, as the birds were hatched from the same parent stock. For example, we brooded two lots of chicks side by side on a grass plot, each brood being hatched twelve days apart from eggs laid by the same birds. Each lot was given the same attention, like food, and brooded in identical outfits. Out of one lot of 192 we reared 157; out of the other of 265 we lost over 200. As the birds were forced to lay so many more eggs during an extended period in captivity than they do in the wild state, there may be times when the germ becomes weak. In view of the fact that this is one of the very few states, possibly the only one, that uses artificial brooders exclusively, we can not ascertain whether or not this result is due to the (artificial) methods used. However, from results obtained during former seasons when domestic hens were used for brooding, we feel safe in stating that, while there is room for improvement in our method, it will be more generally adopted as pheasant breeding progresses.

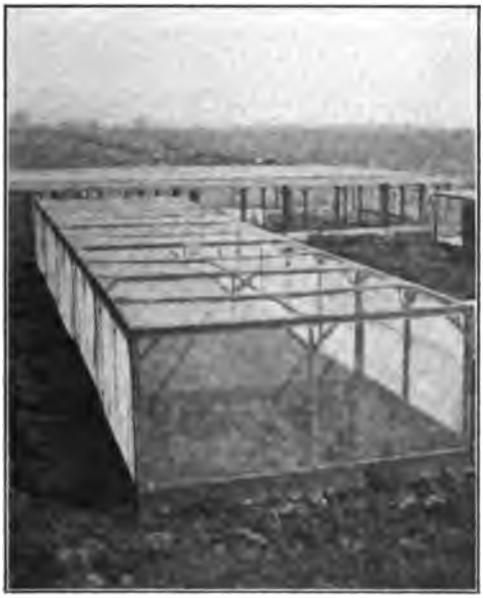


Fig. 69. Portable pens used for breeding quail and pheasants, State Game Farm, Hayward, California. Photograph by W. N. Dirks.

Feed.

During the 1915 season we devoted several hours each day to the preparation and grinding of food for the young birds, using greenstuff, such as lettuce, kale and beets, all of which was grown on the farm, together with cracked wheat, stale bread, hard-boiled eggs and cooked chopped meat. While the birds apparently relished this food, the results did not justify the time and energy expended.

During the 1916 season the birds were brooded on a lawn, thus affording them plenty of greens. Plain dry feed consisting of cracked wheat, cut oats with a sprinkling each of charcoal, ground green bone and oyster shell, which required practically no time to mix, was fed them. The birds appeared to do just as well on this dry mixture, which is more preferable, as it does not become stale and sour.

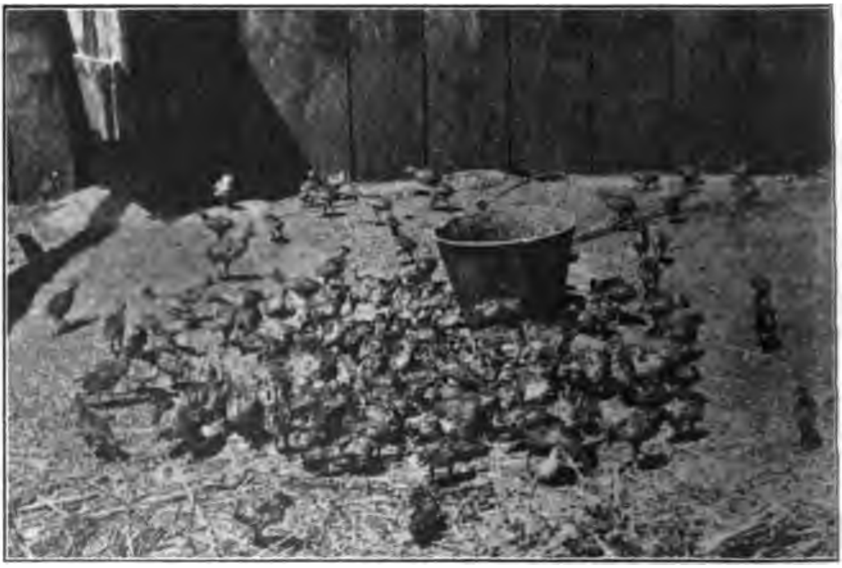


Fig. 70. Young pheasant chicks at State Game Farm. Photograph by W. N. Dirks.

Exhibitions.

The commission has exhibited the birds from the Game Farm at various poultry shows and county fairs. This has been done for the purpose of advertising the activities of the commission in the propagation of game and to educate people regarding opportunities in the breeding of pheasants, ducks and other game birds, both for stocking and for food purposes. Much interest was developed by these exhibitions, especially by those which were held at the State Fair and the Panama-Pacific International Exposition. At the Exposition there were displayed several varieties of quail, pheasants and ducks, the exhibit occupying a floor space of 12 by 100 feet. From the keen interest displayed at this exhibit, there appears to be a wide field for work of this nature. It gives those interested in hunting an opportunity to realize the beauty and variety of wild life, at the same time creating a more generally intelligent understanding of the work of the commission.

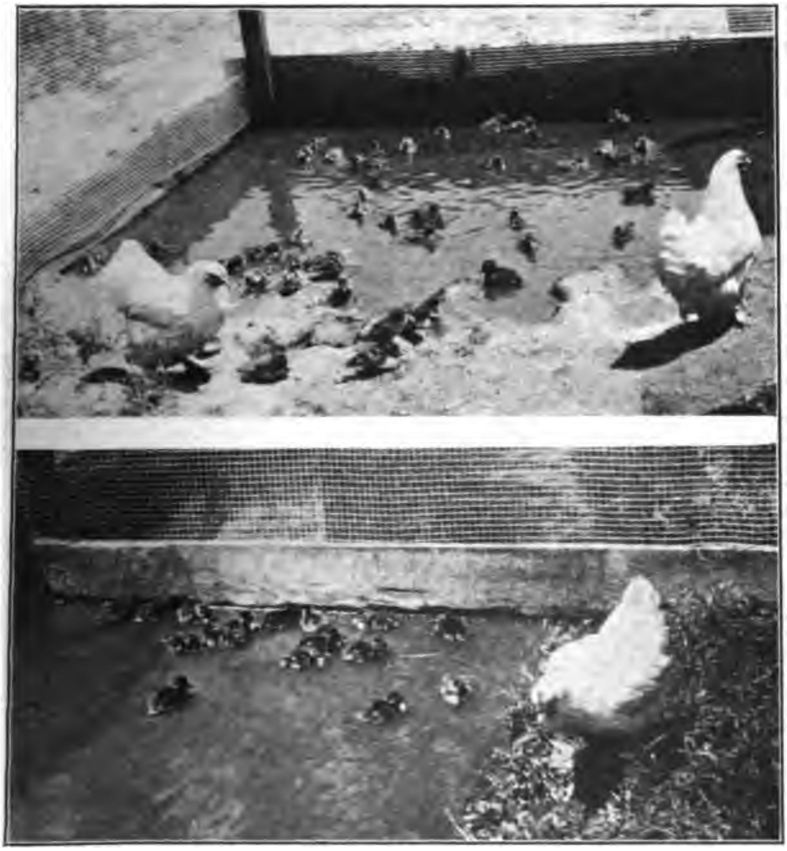


Fig. 71. Ducklings and their foster-parents at State Game Farm. The ducklings were hatched from eggs collected in nearby marshes and from those deposited by captive ducks. Photograph by W. N. Dirks.

Breeding Stock.

The breeding stock at the Game Farm on July 1, 1916, was as follows:

Valley quail, including young stock	350
Mountain quail	15
Bobwhite quail	20
Golden pheasants, including young stock	17
Silver pheasants, including young stock	14
Ring-necked pheasants, including young stock	140
Ducks (13 species, including fulvous tree-ducks)	575
Geese (4 species)	9
Coots	10
Great blue heron	1
Total birds	1,151
Black-tailed deer	2
Mexican white-tailed deer	1
Total mammals	3

Time will show whether or not the efforts of the commission respecting the planting of pheasants has been worth while. That they are firmly established in some localities appears certain. In the Santa Clara Valley, for instance, it is not an uncommon sight to see two or three pheasants foraging in the fields along well-traveled roads. On April 4, 1916, Deputy I. L. Koppel and myself put up a total of 15 pheasants at different points between Coyote and Milpitas. Although parts of the Santa Clara Valley seem to meet the requirements of the birds, certain factors will probably prevent them from ever becoming overabundant. Being very partial to moist ground, pheasants choose alfalfa fields in which to nest. As nesting occurs at a time when the hay is being harvested, a great many nests are destroyed. Through the efforts of Deputy Koppel, the Game Farm obtained a number of eggs from destroyed nests. Thirteen eggs taken from a nest of seventeen on April 22, 1914, hatched on the 24th. Eleven birds were reared to maturity, although these eggs were five hours on the trip. During the season of 1916 a total of seventy eggs taken from nests destroyed while mowing hay were received at the Game Farm. This justifies the adoption of some feasible plan whereby more of the eggs from destroyed nests could be utilized.

Fig. 72. Fulvous tree-ducks on pond at State Game Farm. Photograph by Theódore Kytka.

Quail.

Quail are brooded and fed exactly the same as the pheasants, but there is no resort to bantams for incubating the eggs. While we have had very poor success in artificially incubating the pheasant eggs for the entire period, the result is quite the contrary with quail, 90 per cent of the fertile eggs often being hatched. As the quail chicks are very tiny, it is a problem to obtain a brooder that will afford them sufficient heat, especially during the night. All brooders are planned and made to meet the requirements of young chickens. As the quail are many times smaller, it follows that they are much farther away from the heat-giving device. With a coal oil brooder the flame can not, with safety, be carried high enough to supply sufficient heat to the quail three inches below the bulb of the thermometer, which is set to register the temperature suitable to the chicken. To partly offset this condition we have raised the floor with burlap padding, bringing the birds closer to the heater. Quail themselves can best care for the chicks, but they must be penned up in individual cages made of small mesh wire and not be disturbed in order to have them successfully raise their own broods. Since this method is expensive and but few birds can be reared, it is probable that rearing quail for the market will never become a paying proposition. The only feasible plan that presents itself to conserve this bird is to locate a game farm in natural quail territory, absolutely protect the birds, and when the increase warrants it, trap and ship them to depleted localities. The future existence of this very desirable bird demands that steps be taken toward this end in the near future.

Fig. 73. Canada geese at State Game Farm. Photograph by Theodore Kytka.

Ducks.

From the modest number of three ducks, we have gradually accumulated, through trapping, taking eggs in the marshes and through the increase of our own stock, several hundred ducks. Fourteen varieties are represented which, with four varieties of geese and a number of coots, make an excellent collection of waterfowl. During the season of 1915 several mallard hens nested and successfully reared broods, taking the young ducks on the pond as soon as they were sufficiently dry. Our one cinnamon teal hen also nested and hatched nine young, but did not rear a single bird. During the present season, out of a total of twenty-six mallards nesting, the average of eggs was only five.

After several hens had lost their entire broods within a period of a few days, all of the eggs in the pens were gathered regularly and set in incubators. The ducklings were given to domestic hens to rear. If we had expected to operate this season necessary preparations would have been made for the proper handling of these birds. As it was, too many were confined together. One of the very peculiar features of these birds was brought out this past season when one shoveler out of a total of twenty hens that we have had for three years nested and hatched for the first time. None of the other species of ducks have nested. We have successfully retained several fulvous tree-ducks on the farm for the past two years. These birds have attracted a great deal of interest.

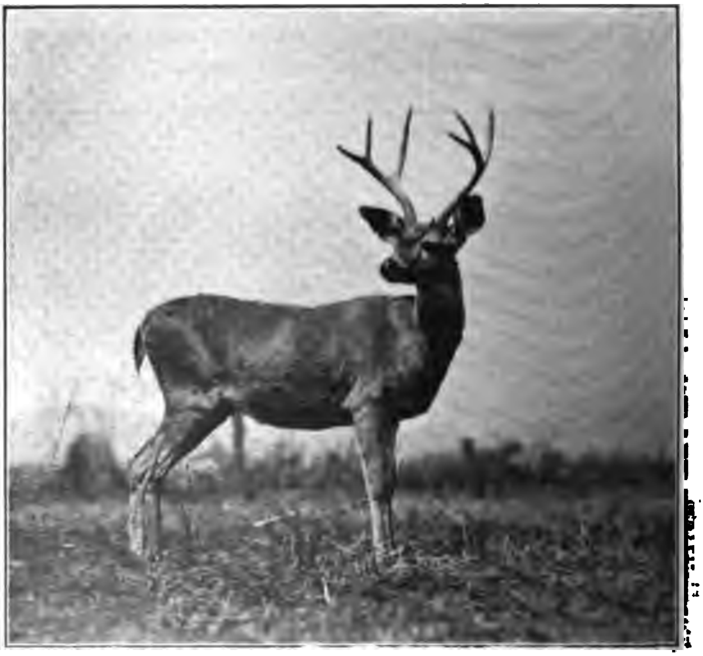


Fig. 74. Black-tailed deer at State Game Farm, Hayward, California. Photograph by Theodore Kytka.

Deer.

Several black-tailed deer which were on the farm for a number of years were disposed of in the fall of 1912. Since that time two deer of the same species have been secured and have found a home on the farm. One of these, a spotted fawn, has been successfully reared on a bottle. A Mexican white-tailed deer fawn has been the only other addition to our stock of game mammals.

Respectfully submitted.

(Signed) Wm. N. Dirks,
Superintendent State Game Farm.

REPORT ON POLLUTION OF WATERS.

The Honorable Board of Fish and Game Commissioners.

Gentlemen: The importance of keeping our streams and bays free from substances injurious to fish is conceded by all. Fish have a sufficiently hard struggle for existence without man contributing additional difficulties in the form of injurious waste products. Furthermore, fish which might not suffer from contact with, or absorption of, such substances, may face starvation because the plankton upon which they feed has been destroyed by pollution. It can, therefore, be considered a signal victory that section 635 of the Penal Code was so amended at the last legislature that it now includes practically all sources of water pollution.

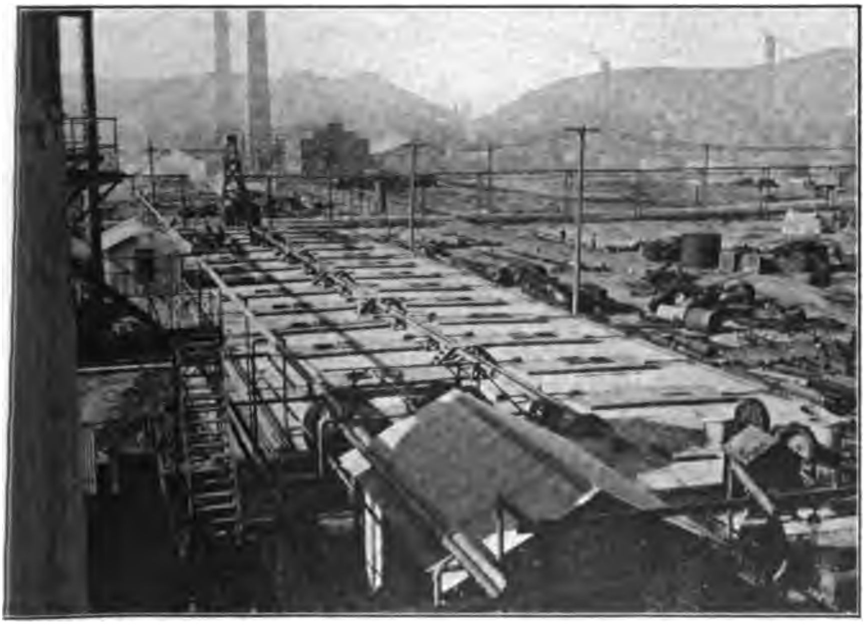


Fig. 75. Birdseye view of main separator of the Standard Oil Company plant at Richmond. The capacity is 20,000,000 gallons of waste per day. Photograph by A. M. Fairfield.

The most common sources of water pollution with which California has to contend are: refuse from wineries, wash-water containing leaves, rootlets, etc., from the beet sugar factories, lampblack and tar from gas plants, and fuel oils and sludge from steam vessels, refineries, and other industries which use oil as a fuel. The refuse from the wineries and beet sugar mills decomposes and ferments very rapidly after it is deposited in the water, forming carbonic acid gas which is deadly to fish life.

Particular attention has been paid to pollution by oil and lampblack. The problem confronts the gas companies of devising a rapid and continuous filtering system which will retain *all* of the lampblack and thus allow the water to return to the bay or stream perfectly clean. The magnitude of this undertaking will be better realized when it is understood that an average of twenty-two pounds of lampblack is produced to each thousand cubic feet of gas, and that San Francisco alone, during the month of January, 1916, manufactured 613,947,000 cubic feet of gas, and about 4000 tons of lampblack.

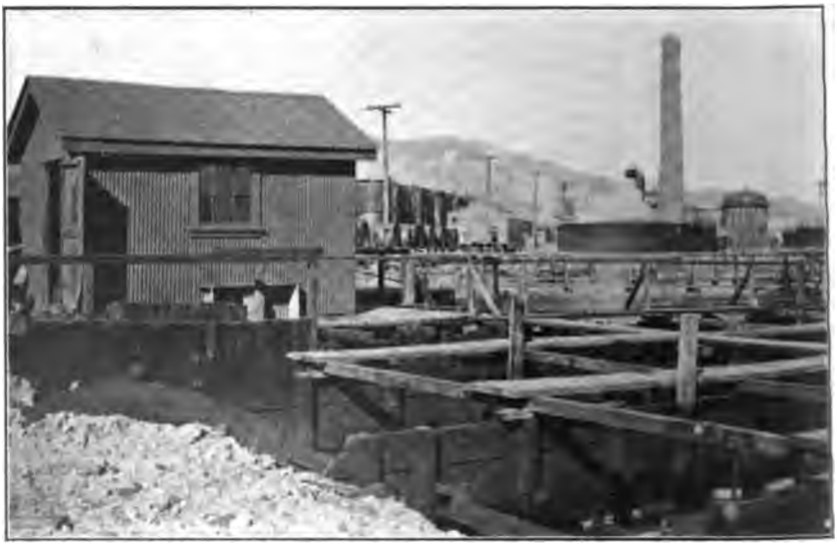


Fig. 76. Detail view of baffles of the Standard Oil Company plant at Richmond. The oil collects behind the baffles and is skimmed and pumped back into the separator. Photograph by A. M. Fairfield.

To meet this situation the Pacific Gas and Electric Company has, in the bay counties alone, spent not less than $100,000 during the last two years. The old system of settling pits, which required a large area to operate successfully, has been finally and definitely abandoned, and attention turned to newer devices. All known filters have been tried with more or less success. Straw filters were found to work very satisfactorily where the lampblack production does not exceed 5000 pounds per day, and a model filter of this type was installed in the Vallejo plant. In the larger plants this filter is too slow and expensive. A straw filter similar to the one at Vallejo, but of less capacity, is under construction at Napa.

The three best known types of mechanical filters for handling lampblack are the Oliver, the Kelley, and the Butters. All of these originally were devised for use in mining operations, but with some changes and improvements have been adapted for use with lampblack.

The Oliver filter, the most expensive and complicated, has proved the least satisfactory. One of this type is in operation at the Metropolitan plant of the Pacific Gas and Electric Company in San Francisco, and in Los Angeles, but it is unlikely that any future installations will be made.

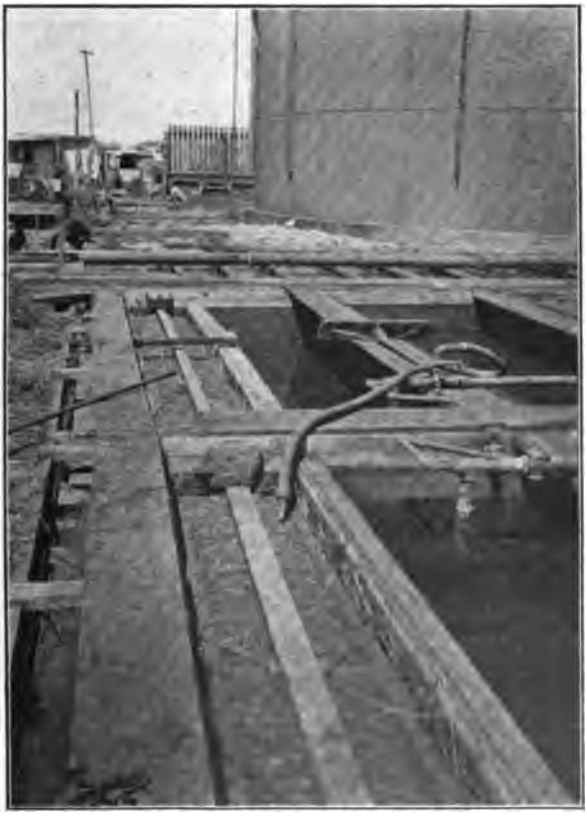


Fig. 77. Superior type of straw filter of the Pacific Gas and Electric Company at Vallejo. Photograph by A. M. Fairfield.

The Kelley filter has passed the experimental trial successfully and a battery of three of the largest size has been ordered for use at Station "B" in Oakland. The cost will be $29,100.

The Butters filter has so far proved the most effective and economical device. Its low first cost, the economy of its maintenance, and its ability to discharge water absolutely free from lampblack, added to the fact that it can be made in any size from a unit of one or two leaves up to any number needed to handle the maximum lampblack output of any plant, makes it by far the most effective and popular installation.

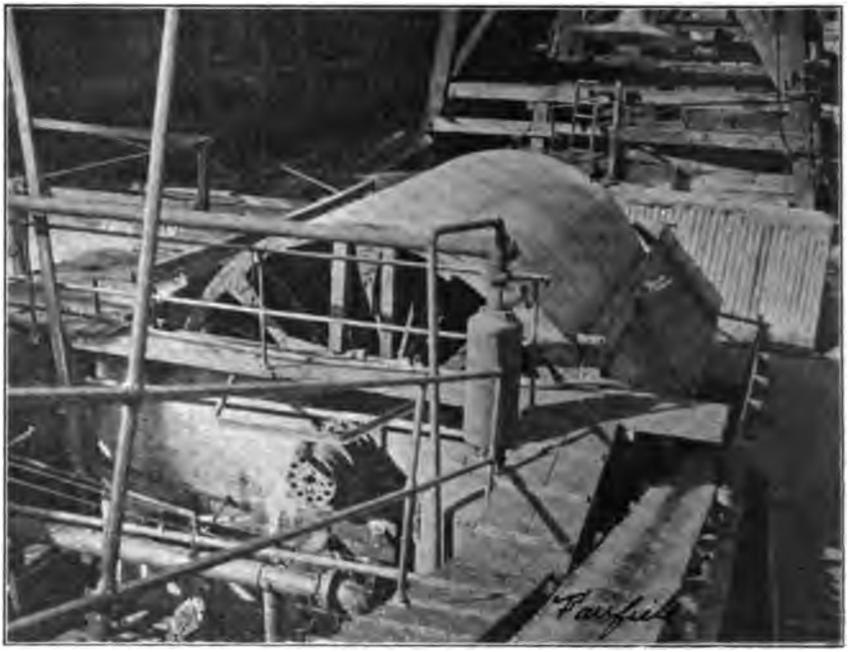


Fig. 78. Oliver filter at the Potrero plant of the Pacific Gas and Electric Company, San Francisco. Photograph by A. M. Fairfield.

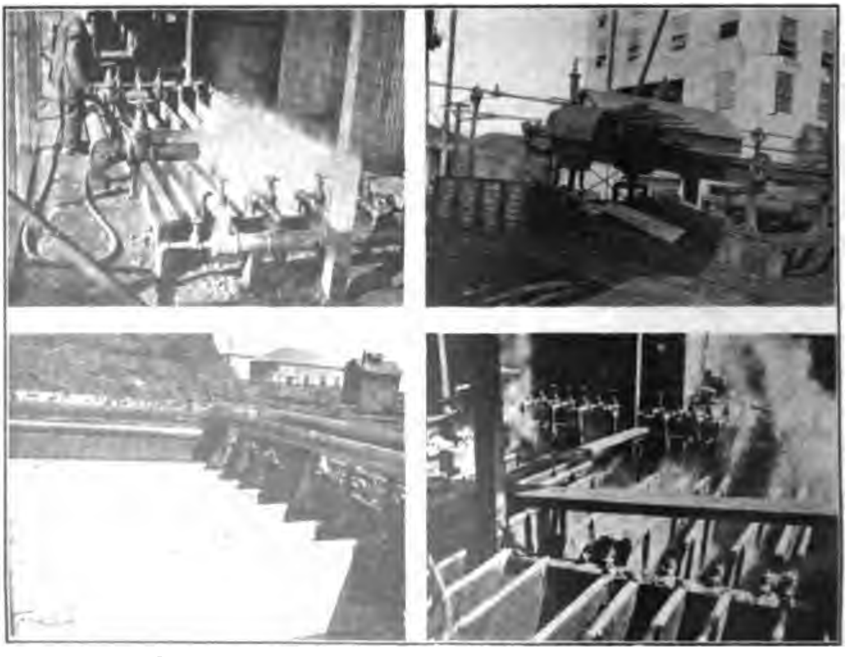


Fig. 79. Kelley filter-press of Pacific Gas and Electric Company at Oakland. Butters filter at San Jose. Butters filter, Potrero plant of Pacific Gas and Electric Company at San Francisco. Butters filter at Oakland. Photographs by A. M. Fairfield.

This type was experimented upon, some changes and improvements effected, and the perfected and model installation made by the engineers of the Oakland plant of the Pacific Gas and Electric Company. Butters filters are now in use in Oakland, San Jose, San Francisco (Potrero plant), and Santa Rosa. The Pacific Gas and Electric Company plans to install this system also at San Rafael and Vallejo, and will in time use it in all plants making 200,000 cubic feet or more of gas per day. Butters "leaves" are also being used in the dewatering box of the Oliver filter at the Metropolitan plant of the same company in San Francisco. The Western States Gas and Electric Company has been advised that an adequate filter must be installed at its Stockton plant. They will, undoubtedly, choose the Butters filter, as being the most efficient and economical.

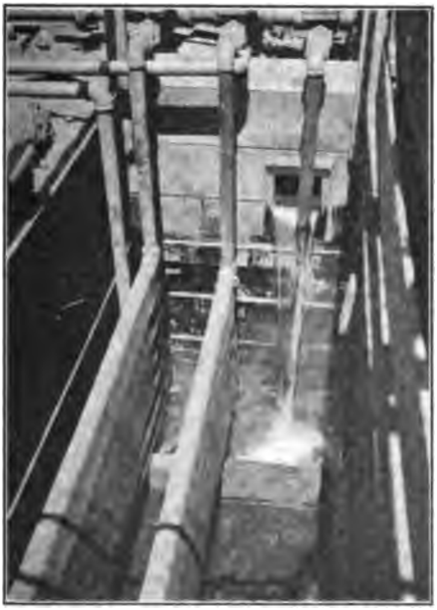


Fig. 80. Butters filter at Santa Rosa. Handles lampblack from 375,000 cubic feet of gas per day. Photograph by A. M. Fairfield.

The leakage of oil into our waters is a serious source of danger to fish, and the efforts to avoid this danger entail the expenditure of large sums annually. Oil is most frequently discharged in the waters of California because of accident, due to the breaking of pipe line, or the bursting of a hose of a tank vessel being loaded or discharged. Such accidents are deplorable and often cause great damage. When the Standard Oil Tanker Bradford went aground on the San Francisco bar it was necessary to jettison 2000 barrels of oil in order to float the ship.

The Standard Oil Company at Richmond has spent over $105,000 in the construction of separators and canals to trap waste oils and sludge. Of this amount $50,000 has been expended during the last two years. The main separator is built of concrete, is 240 feet in length, 70 feet in width, and 22 feet in depth, handling 20,000,000 gallons of water and oil daily. Fifteen men are required to attend to the separators to skim oil and handle tidal gates. The monthly pay roll of these men is $1,500. In addition to the concrete trap there are about one and one-half miles of ditches, averaging thirty feet in width, equipped with baffles to catch any oil which might not otherwise be trapped. These ditches also handle the 10,000,000 gallons of water which pass through the asphalt plant daily. All valves on oil lines on the wharf are supplied with tubs to catch the drip, and loading hoses are drained into drums. The accumulation is then pumped back into the refinery.

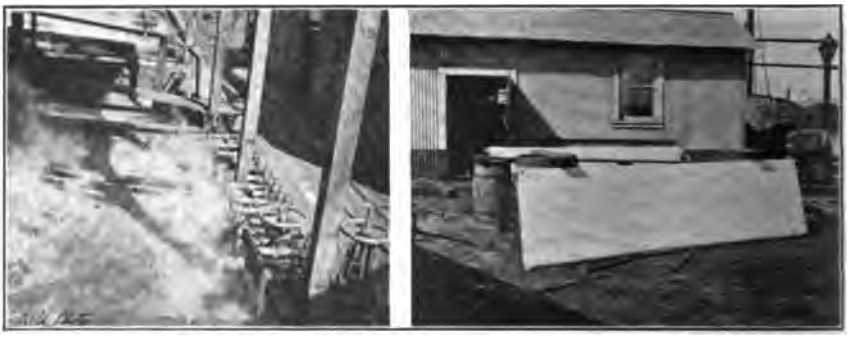


Fig. 81. Butters filter and filter leaf at plant of Pacific Gas and Electric Company at Oakland. Photograph by A. M. Fairfield.

The Union Oil Company has expended several thousand dollars in construction and repair work at the Oleum refinery, and contemplates further expenditures of some $25,000. The company plans to continue its work until satisfactory conditions are obtained.

The Shell Oil Company has built adequate oil traps at the new refinery at Martinez and no trouble from the disposal of waste oil is expected.

The Associated Oil Company has ample settling area for waste oils on its property at Avon and has experienced no difficulty in keeping such waste out of state waters. This company, as well as others, has agreed to notify the Fish and Game Commission immediately by telephone when accidents occur which result in the depositing of oil upon any waters, thus giving the commission an opportunity to make immediate investigation of the cause of such accident, and to estimate the probable damage.

The Southern Pacific Company has installed concrete traps 10 by 15 by 60 feet at San Luis Obispo, Watsonville Junction, San Jose, and San Francisco, and these are in successful operation. The San Francisco installation cost about $4,000, but we have been unable to ascertain the cost of the others. The Western Division has built two new traps in the West Oakland yards during the year past, at a cost of about $1,500, which they propose to enlarge to about four times the present area. The monthly pay roll of the trap tenders at present is $110.67.

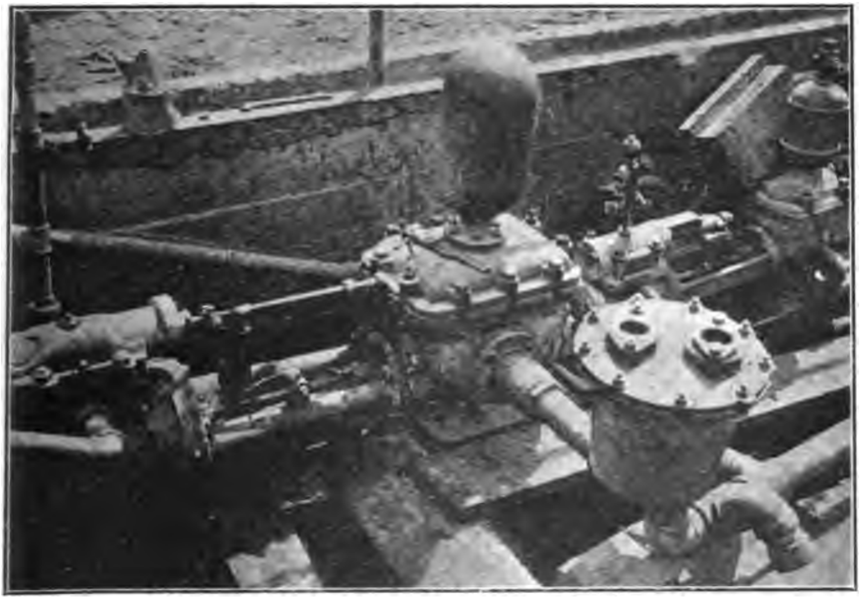


Fig. 82. Pump for waste oil recovery in oil trap of the Southern Pacific at West Oakland. Photograph by A. M. Fairfield.

Numerous analyses have been made of the discharges from the various chemical plants and the larger tanneries to determine whether or not they contain substances injurious to fish or plankton. This work has not been completed and we are not prepared, therefore, to submit a statement or opinion. Beginning July 1, 1916, the work of investigation and prevention of water pollution will be under the supervision of W. H. Shebley, Superintendent of Hatcheries, and will be handled under his direction throughout the state and without reference to districts.

Respectfully submitted.

(Signed) A. M. Fairfield,
Deputy and Assistant.

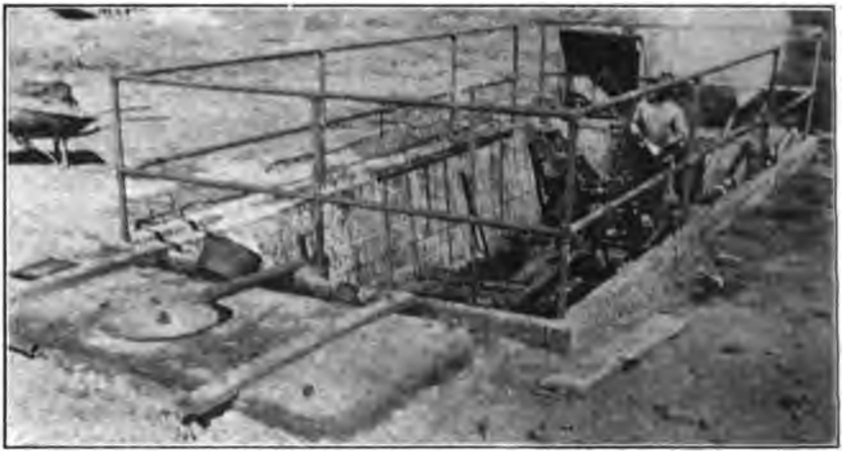


Fig. 83. Oil trap of the Southern Pacific at West Oakland. Photograph by A. M. Fairfield.

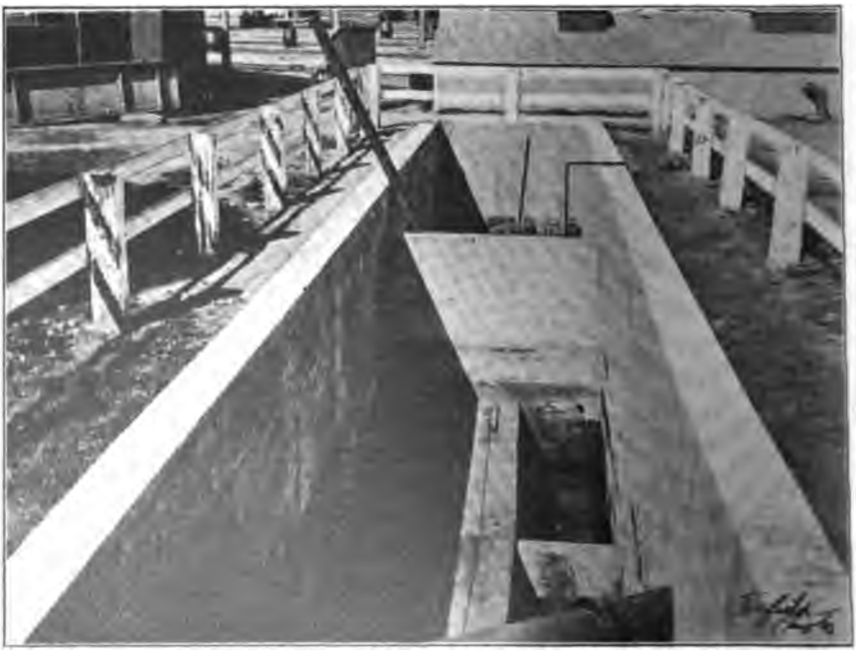


Fig. 84. Southern Pacific oil trap at San Jose, 10′ x 60′ x 18′. There are similar traps at San Luis Obispo, Watsonville Junction and San Francisco. Photograph by A. M. Fairfield.

REPORT OF SAN FRANCISCO DISTRICT OFFICE.

The Honorable Board of Fish and Game Commissioners:

GENTLEMEN: During the past two years fines totaling $23,785 were imposed upon 1169 violators arrested by the assistants working in the San Francisco Division. This excellent record shows well the support received from the magistrates before whom fish and game cases are tried.

For the most part, it can be said that throughout the entire division the assistants are receiving more help from people who believe in game conservation than ever before. This is because every one is beginning to realize that it is part of his duty to see that the laws made for game perpetuation are enforced and that it is up to him to assist the officers sworn to enforce the fish and game laws.

It is frequently asked why it is necessary for the commission to maintain a force of deputies in San Francisco, where there is no game. Although there is no hunting in San Francisco the results of the many violations occurring in the surrounding country are taken to San Francisco. During the past two years there were seized by the deputies in San Francisco, 4027 crabs, 6753 pounds of fish, 137 pounds of deer meat, 911 pounds of dried shrimp, and 6483 wild ducks and geese. All of this mass of fish and game had been taken or was held in violation of the law. During the same time, there were tried in the San Francisco police courts 132 game and fish cases. From this statement it will be seen by the reader that although there may be no living game in San Francisco there is a vast amount of illegal game held there during a year's time.

Game Conditions.

From the sportsman's point of view the coast region of California is particularly fortunate in having an extensive area of rough brush-covered land unsuited for agricultural purposes. On these lands the many varieties of native game have excellent cover and with the proper laws to protect and proper enforcement of these laws there will be an abundance of game for a long time to come.

There is no city of the size of San Francisco in the United States, or possibly in the world, that offers the same opportunities to the sportsman as does San Francisco. Within seventy-five miles of the thickly-settled bay region there are killed each year hundreds of deer and thousands of quail, doves, ducks and other small game. The best part of this, and the most encouraging, is the fact that under our present laws, with some slight changes, nearly all species will hold their own, if not increase.

Deer. There have never been game laws based upon more sound principles than the present acts relating to deer. The season in the coast region was changed at the last session of the legislature so that for the most part the killing of deer when the horns are in the soft velvet is prohibited.

With scarcely an exception the law giving protection to spiked bucks has been conceded by sportsmen to be one of the best that has ever been passed by our legislature. Young male deer are practically always found with the females. On account of this fact, and on account of the impossibility of telling the sexes apart, even at a short distance, it is essential that the hunter be most certain as to what he is shooting. There are, unfortunately, many careless hunters who shoot at the first sign of moving brush, with the result that frequently some other hunter is killed or dangerously wounded. This law compels the deer hunter to be certain of the character of the deer he is shooting and will, without doubt, save the lives of many of his fellow sportsmen. Reports show that the present year has been an excellent breeding season, as does with two fawns are the rule.

During the winter of 1915–1916 many deer were found dead in the northern coast counties. Investigations carried on by the commission did not reveal any new light on the cause of the deaths, but did confirm the belief that an abnormal number of internal parasites are probably largely responsible. It is possible that the deer are weakened on account of the severe winter weather and are unable to throw off the parasites. It is interesting to note that in no other part of the state has there ever been any epidemic of even minor importance among the deer. It is the intention of the commission to study these occasional epidemics and to endeavor to save the hundreds of deer that are lost each winter.

Quail. Quail have had an excellent summer. Young broods of both mountain and valley quail are seen commonly in the haunts frequented by these birds. Making the seasons during which both species can be taken the same has been of great benefit in this district. Very little complaint has been received on account of the later opening of the mountain quail season, for it is uniformly realized that the breeding season is the same and it is not right to kill the young birds before they are fully grown. Although there is a great difference in the plumage of the two species, there has been considerable confusion among hunters as to which species they were shooting. In certain instances, unintentional violations have occurred.

Waterfowl and Shore Birds. Duck shooting in the bay region was very poor during last year although there were many more ducks bred on the eastern side of the bay than usual. Shooting in all sections was below normal. Even in the San Joaquin Valley birds were not as abundant as in former years. The state law was changed at the last session of the legislature to conform with the Federal Migratory Bird Law, thus prohibiting shooting during the month of February. This, without doubt, has greatly increased the number of locally nesting ducks and will probably, during the coming fall, make good shooting in the early part of the season before the so-called "northern" birds arrive.

In the spring of 1916 there was a remarkable flight of jacksnipe in the Livermore Valley, Alameda County. Thousands of birds appeared and bag limits were the rule. In other sections this excellent game bird appeared in fair numbers. On account of the Federal Migratory Bird Law giving protection to all of the shore birds except the black-breasted and golden plover, greater and lesser yellowlegs and jacksnipe, and on account of the difficulty the average hunter has in identifying the different shore birds, it was recommended to the Department of Agriculture that all shore birds except the jacksnipe be included in the protected list. This has been done so that at present the only shore bird upon which there is an open season in California is the jacksnipe. Their open season is the same as that for ducks and geese.

Doves and Pigeons. There has been considerable increase in the number of doves on account of the delaying of the open season until September 1st. By that date most of the birds are through nesting and the young birds have reached a sufficient size so that they are able to look after themselves if the parents should be killed. It will take a number of years to bring the doves back to their former numbers, but if the present law is continued this will surely be accomplished.

Band-tailed pigeons have been reported in increasing numbers in many parts of the district and have been found nesting in sections where they were formerly not supposed to breed. The delayed protection given this species has, without doubt, added greatly to the number of birds and will mean their perpetuation as a game bird.

Introduced Game. Several years ago a small plant of wild turkeys was made in the western part of Sonoma County. It is claimed by parties living in that region that there are now several hundred birds thoroughly wild. Another plant, made in Humboldt County, is reported to have been almost as successful. If the birds in these sections continue to increase, all of the money expended by the commission in turkey experiments will have been well spent and by drawing on these regions turkeys can be secured for stocking other sections adapted to them.

Respectfully submitted.

(Signed) J. S. HUNTER,
Assistant Executive Officer.

REPORT OF SACRAMENTO DISTRICT OFFICE.

Administration.

The Honorable Board of Fish and Game Commissioners.

GENTLEMEN: In submitting a summary of the work of the Northern, or Sacramento District for the past two years, it may be pertinent to state that the district consists of twenty-three counties, as follows: Alpine, Amador, Butte, Calaveras, Colusa, El Dorado, Glenn, Lassen, Modoc, Nevada, Placer, Plumas, Sacramento, San Joaquin, Shasta, Sierra, Siskiyou, Sutter, Tehama, Trinity, Yolo, Yuba and a portion of Solano. Approximately 45,000 square miles of diversified territory are included, an area almost equal to that of the state of New York. The division office at Sacramento is under the able control of F. M. Newbert, for five years president of the Board of Fish and Game Commissioners. An office force of four is maintained and twenty-two deputies are under the direct supervision of this office. The location at the state capital increases the importance of the work of this district.

The district has approximately 14,500 miles of streams and about 400,000 acres of lakes, thus making it particularly rich in fishery resources. Practically all these bodies of water contain, or are capable of sustaining, edible fish life of many species. All of the large valley streams contain such choice fish as salmon, shad, black and striped bass, perch, sunfish, crappie and catfish, together with many other species, while the snow-fed mountain streams and lakes contain nearly all the known species of trout, both native and foreign. All the northern counties of the district contain game birds in abundance and possibly more waterfowl are to be found in this district than in all the rest of the state combined.

Development of Public Sentiment Favorable to Game Protection.

So successfully has public sentiment been developed that many of our people do not realize or see the necessity of a greater measure of conservation. Increased interest in the protection of fish and game has been very marked in the past few years. Residents and visitors are now beginning to realize what a great asset fish and game are to the community. In years past few arrests were made and it was almost impossible to secure a conviction by jury even in the face of strong and conclusive evidence. How different today! The commission now fearlessly submits the equity of the game laws to a judge or jury. Due to the steadily-growing belief of our best citizens that the fish and game laws are of equal value with other laws on our statute books, the commission and its officers receive the hearty cooperation of the county prosecutors and justices.

Game Refuges and Preserves.

The recently added area of a portion of the Trinity National Forest in Trinity County to the game refuges of our state is giving needed protection to many quail, grouse and other game birds and animals. Refuges are in reality natural game farms and are much better adapted to the propagation of game than all the artificial game farms taken together, for the reason that game artificially propagated and hand-fed is prone to become too confiding and when liberated falls an easy prey to both man and predatory animals. An ideal refuge for waterfowl could be established in central California, in Butte, Colusa, Sutter or Yuba counties. Such a refuge would pay 1000 per cent on the investment and insure the perpetuation of California's supply of ducks and geese and probably also the supply of many neighboring states. Unless something of this nature is done, and done soon, there will be an end to the once wonderful flight of geese and ducks through central California, for the increase of reclamation of swamp lands is destroying their breeding grounds. Very large percentages of several species of ducks nest and rear their young in the counties above named, because conditions of feed, water and safety make it to their liking. The banding together of a large number of northern California sportsmen to hold from reclamation 16,209 acres of land in Sutter, Butte and Colusa counties, is therefore to be commended. The withholding of these swamp lands also means much to the fishing industry, as the duck grounds adjacent to the Sacramento and Feather rivers are huge natural hatcheries for black and striped bass, catfish, and perch. The reclamation of these lands would mean to the ducks and shore birds what the reclamation of such lands has meant to the fish. The steady decline in the supply of many of our choicest food fishes can be laid to the reclamation of the huge inland region.

Fish Planting From Overflowed Areas.

As neither catfish, perch, black bass, crappie nor any of the sunfishes are propagated in our state hatchery at present, much of the replanting of these fish has been and must be made by saving them from overflowed areas in these districts.

In 1904 and 1905 the writer, assisted by the commission and the late Deputy Cross, stocked 318 streams and lakes with 1483 cans, or approximately 14,830 adult black bass, besides numerous other food fishes, with fish saved from overflowed areas in Sacramento, Yolo and Sutter counties. The majority of these fish were planted south of San Francisco. Further work of this character will be necessary this coming fall and winter (1916), owing to the high stage of water last season, which distributed these fish into the lowlands which later dry up.

Winter Feeding of Game.

According to statements of old residents, the winter of 1915–16 was perhaps the most severe ever experienced in the northern counties and consequently very destructive to bird and animal life, especially to mountain quail. While undoubtedly a large number of deer and mountain quail died from exposure or became the prey of predatory animals, the number reported was no doubt exaggerated. In Trinity, Modoc, Shasta, Plumas, El Dorado, Tehama, in fact, in all the mountain region, these birds were fed and cared for during the heavy snowfall last winter.

As soon as this district office was notified prompt action was taken by President Newbert to remedy the condition. Quantities of grain and hay were purchased by our deputies in the different districts. These men, being adepts in the use of snowshoes and skis, saved thousands of birds and animals by their prompt action. The small sum of $134.32 was spent by this office in the purchase of feed, but this sum does not represent the entire amount expended for this purpose. The game protective organizations in various counties acted quickly and in many instances relieved the situation before arrangements could be made by our deputies to purchase feed or reach the locality where game was in distress.

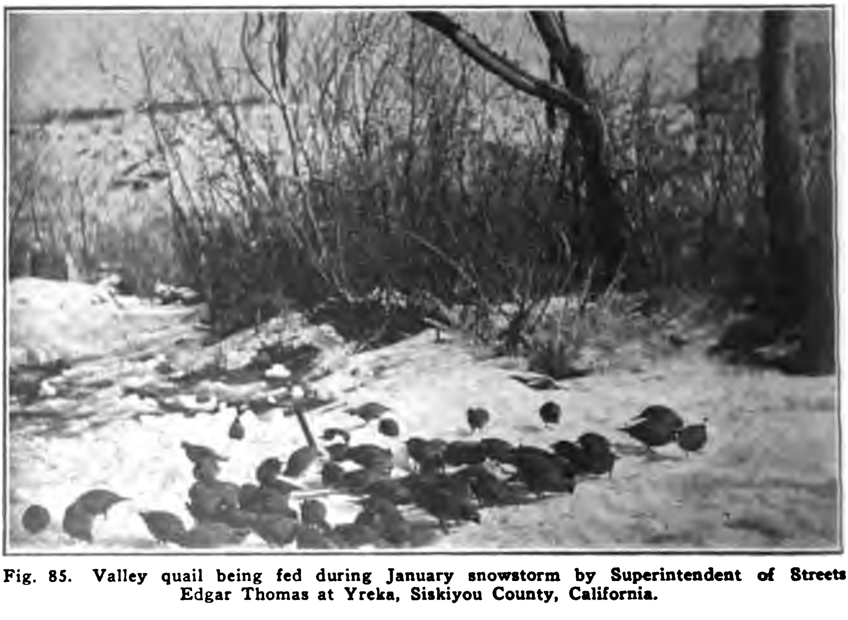


Fig. 85. Valley quail being fed during January snowstorm by Superintendent of Streets Edgar Thomas at Yreka, Siskiyou County, California.

Deputy Ray O'Connor of Nevada County fed eleven bunches of quail and many deer. Deputy Cady of Susanville fed several hundred mountain quail and deer. He also killed over forty sharp-shinned hawks which were preying on the snow-bound quail. Deputy White of Castella used a novel method of feeding quail along the Sacramento River and railroad track by making use of a hand car. He also scattered feed along the road from the rear of a railroad train. Many hundreds of quail had taken refuge along the track and on the banks of the Sacramento River. Many deer were observed swimming down the Sacramento to lower altitudes, and were later cared for by Deputy White. Deputy Warren of Plumas County, assisted by a number of residents, fed and saved a large number of quail and deer. Deputies Streuber and Harris of Siskiyou County, Laws of Trinity and Scroggs of Placer County, all reported having saved large numbers of deer, quail and other birds from starvation.

Thanks are due a large number of residents who, without stinting, fed large quantities of hay and grain to starving game birds and animals and without charge to the state. A. C. Sprout of Copco, on the Klamath, is reported to have fed 300 deer that came to feed with his cattle. Judge Dockery of Hayfork fed forty deer. A. G. Guthrie of Pittville fed seventy mountain quail. L. Albey fed 400 quail near Etna. Edgar Thomas of Yreka cared for a large covey of quail almost in the heart of the city. Dr. Edgecomb of Knob fed several bands of quail. Dr. Tinsman of Adin was very energetic in rendering assistance, together with J. W. Jamison of Dutch Flat. This display of cooperation is gratifying to the commission and to everyone interested in our wild life resources.

Late reports from our deputies advise us that deer, in the northern counties of this district, are plentiful.

A line of game perpetuation endeavor which annually is increasing in scope is the heavy planting of trout fry in the numerous streams and lakes of this district, thereby not only taking cognizance of the demands of the sportsmen of the state, but also of the public demand for edible fish.

Northern California is now the mecca of sportsmen from all over the United States. These sportsmen are as keen, if not keener, in their appreciation of the scenic, climatic and outdoor life attributes of this section of the state than even the residents themselves. Through constant and consistent endeavor on the part of the Game Commission the old evils which confronted the sportsman and game lover are being eradicated rapidly and an appreciation of what game conservation and law observance means is restoring the depleted streams and game covers.

Respectfully submitted.

(Signed) GEORGE NEALE,
Assistant in charge Sacramento District Office.

REPORT OF THE LOS ANGELES DISTRICT OFFICE.

The Honorable Board of Fish and Game Commissioners
of the State of California.

GENTLEMEN: Fish and game work bore better fruit in southern California during the last two years than in all previous experience of the organized efforts whose prime object has been to provide better sport for the licensees whose dollars finance the commission charged with this great public service.

"Nothing succeeds like success"; and sentiment today stands just as squarely behind conservation in southern California as it does in the eastern centers of radicalism, where some have weaned themselves away from the practical aspects of the problem to chase the chimera of sentiment. In this state, the close relation between their Fish and Game Commission and the sportsmen has made the work one of providing more fish to catch and more game to shoot. The most valuable sentiment revolves around sporting rather than around the ultra-æsthetic, the end and aim of which is to set the gun in its rack and the rod in its corner for all time. Too vast an "allied industry" has developed about California fish and game to suffer such a loss, not to mention the plain and direct attraction value it has demonstrated in encouraging men of means to make this commonwealth their home.

The sportsmen of southern California under the present administration of their affairs have seen their fish and game grow with the increases of the field-patrol force. In 1915, they enjoyed the best fishing and the most diversified sport with the rod that has ever been their good fortune. Rainbow trout of large size had grown from Fish and Game Commission plantings in the artificially created mountain reservoir lakes until an entirely new sport had been developed. So likewise with the gamy and toothsome importation from the East, the black bass. Meanwhile, every native form of fishing showed marked improvement. Stream fishing was phenomenally good when the increased number of angling licensees is considered. Hunters enjoyed the best quail shooting in a decade during the extended season wherein the commission vindicated its promise to recommend a longer shooting period as soon as quail increased sufficiently to permit it. Duck-shooting on the clubs was good all through the winter; doves gave excellent sport in September, and the deer crop in some of the counties was the heaviest in several years, Santa Barbara notably reporting a killing double that of the year before.

All these good things came in conjunction with the most business-like and vigorous campaign in behalf of fish and game conservation that it ever has been financially possible to make in southern California, Commissioner Connell having announced that the income of the work seemed to have attained sound enough foundation to warrant establishment of a big hatchery to anticipate demands of the future, and broadening of the field-patrol activities by appointment of deputies in every county. The effect of these changes of policy was so immediate and so palpable that credit was freely given to conservation for the results attained. So today, sportsmen in the south stand squarely behind the plan, and violators find themselves arrayed against a quiet but determined public sentiment which shows in numerous prosecutions and stiff fines to chronic violators. Favorable breeding seasons played a strong part in bringing about better game conditions; but no breeding season is favorable unless the gun be kept from the fields. It may now be said that a breeding stock of game has been developed which, with the care it is sure to receive, can weather any demands likely to be made upon it under the law even by the expected increase in the army of hunting licensees taking advantage of it each year. The supply is here; regulating the annual drain to the annual increase is now the problem.

Fish propagation work in the south has been more a matter of distribution than of rearing, but Bear Valley Hatchery has had two good years, albeit expensive in unit cost per thousand of product as judged by the state standard for fishcultural efforts. The May first trout-opening was one of the wisest laws ever passed to benefit fishing in the south. It already has justified the delay on Bear Lake alone. The value of protecting "spawners" through April is no longer questioned even by those who at first fought it bitterly there.

In the game fields, aided by the delayed opening of the rabbit season, the potential presence of deputies has resulted in the best two summers the breeding birds have ever enjoyed. The rabbit law was not so much intended to protect rabbits, which are a pest, as it was to deprive the violator of any legal color of right to be afield with a gun in the nesting season. That it has done, and to it in great measure may the present heavy head of quail and doves be credited. Considerable of the opposition to the rabbit protective measures has died out among large ranchers who undeniably do suffer sorely from the depredations of these animals, entirely because these men of broad vision have themselves seen the benefits of excluding the fire-starting, fence-cutting type of violator from their lands by removing from him the chance to cover his depredation by the excuse of benefiting them through decreasing their rabbits. Many a ranch owner wishes to give the true sportsman every opportunity to enjoy his game; and some are learning that between the sportsman and the summer violator lies a gulf like the sea. For he who respects not the law of the state will not respect the rights of his fellowman, and he it is who usually is careless with all other of the relations of life. Possibly nowhere in the state has the value of the absolute closure of all shooting in summer been so plainly demonstrated as in southern California. Now the man who shoots announces himself as violating the law—a "poacher upon the public"—and blazes the trail to justice.

The rabbit law, like the late trout-opening, has put in the hands of the patrol force a practical power of enforcement equal to trebling its numbers, and is therefore a state asset of at least triple the present pay roll every month. What its incidental benefits in building up a more attractive game supply may be, only the future growth of the state through these most potent inducements can tell. Experience has proved that the love of the rod and gun lies deep in most normal men; and that, other things approximately equal, the majority will cast their lot where they may cast their line with alluring chance of success; will risk getting their gains where they stand chance of getting their game with it. This is not theory, but the most practical reasoning in the world.

Few realize the value of good shooting and fishing as an inducement to tourists and home seekers to come this way; but in the South, world-famed as the playground of men of means, whatever adds to the joy of life by luring to the outdoors must be even more important than elsewhere. Nor is the value solely that of an attraction. In these days of preparedness, who can say how essential may prove these rugged sports which make men of boys by taking the youth of the land away from saloons, pool-rooms and low city company to healthful hills, building strength, self-reliance, character that may one day stand between the nation and its fate?

Realizing the attraction power of the deer interest, the Southern Division under Commissioner Connell's orders, set about making of 1916 a grand "clean-up" of chronic violators whose proclivities for more or less systematic stealing of sport from the law-abiding by "soonering" ahead of the legal opening date, have been under espionage for some time. Backed by repeated information from staunch friends of law and order, the commission was able to accumulate the necessary evidence to run to earth and convict no less than ten confirmed offenders of this class to the great delight of those whose sport in years past had suffered from such marauders. Late in July, Deputy Becker, after a hard chase through the most inaccessible portions of the rugged, craggy Malibu range, known as the "Happy Hunting Ground" of the moderate-circumstanced, short-timed Los Angeles deer seeker, brought to justice Charles Decker and his followers, who were fined. Decker admitted upon the stand the killing of hundreds of deer at all seasons. A few days later, Deputy Barnett succeeded in catching and convicting two hardened offenders; one of them, Byron Secor, had made a business of violating by shipping and selling venison illegally killed. Earlier, Becker uncovered the evidence upon which he convicted Tony Ferriera of killing a deer many months previous, in a forest reserve. All told, 1916 was a bad year for the deer crooks, and did more to put the protection of deer upon a solid footing in the south than all past time combined.

Arrests and convictions for infractions of the quail and dove laws have been weekly occurrences, mostly small matters wherein a motorist had knocked over a quail or two along the road, or "potted" a few doves from posts or wires, unable to withstand the temptation, which is always safely met by leaving the gun at home. The day when men will set forth to make a bag in the closed season is past in southern California. It has become not only an expensive but also a most unpopular practice.

At the opening of the trout season, Commissioner Connell made use of the emergency appointment provisions of civil service to extend the patrol force to such proportions that three dozen competent wardens were keeping an eye open along streams and lakes, camps being established at centers of angling interest such as Bear Valley and Little Bear, under the direction of veteran patrol officers, and the fish were given every possible opportunity to cast their spawn in peace during April. Already the effects are being seen along streams as well as in the lakes. The torrential storms of January washed so severely many of the gorge streams that only extraordinary measures could have built up a breeding stock from the remnant left; but there is reason to believe that when supplemented with the outcome of last fall's plantings, this task has been accomplished.

Although commercial fisheries conservation is public service work of the very broadest character, and there is some moral question as to the right of the Fish and Game Commission to divert the moneys collected from hunters and fishermen to this service, the commercial fishermen have themselves contributed in excess of $10,000 in license fees this year, not to mention quite a sum collected in fines from convicted offenders, and in this way have built up a fund which will finance considerable work in the public behalf. Owing to poor advice, some of the ignorant aliens refused to take license, and it became necessary for the sea-patrol under Deputies Pritchard, Nidever and Barnett to make a grand "clean-up" during June which resulted in no less than forty-six arrests and nearly as many convictions. The licensees found that fishing privileges come cheaper from the commission than from justices of the peace. The Japanese gave no trouble whatever, taking license en masse through the secretary of their association, and to their credit may it be said that they respect the laws even better than the American citizens, once the laws are grasped and understood by their head men.

Acting upon complaints from the Tuna Club regarding violations of the closed "District No. 20" comprising the state waters surrounding Santa Catalina Island, the sea-patrol has maintained surveillance thereupon at every opportunity, and a special arrangement was entered into whereby a resident deputy was commissioned to expedite enforcement of the laws designed to protect the sporting fishing thereabouts, which has been a peculiar and unique asset of southern California, with its opportunity to catch the great tuna, the gamier swordfish of both species, the heavier black sea bass, and numerous smaller kinds.

Laws passed to protect the angling along the seashore by prohibiting the netting or sale of the characteristic game fishes of the littoral have been enforced against several professional seiners whose gear was confiscated and sold, justice being tempered with mercy in all cases but those wherein wilful and repeated violation was proved. The patrol work incidental to enforcing these laws has been financed by the collection of angling licenses from surf fishermen, who are numerous and ever-growing in southern California and who show a sportsmanlike disposition to pay a fair proportion of the expense necessary to protect their favorite varieties.

Beside the immediate features of enforcement work, numerous investigations have been carried forward by experts in the employ of the commission. The activities of kelp harvesters, prospect of successful acclimatization of striped bass in the lagoons of the south, angling and life conditions in Bear Lake, and shellfish are a few of the matters covered. The tuna packing industry, which has become the largest individual feature of the fish trade in California, surpassing even the salmon industry in whose development a lifetime and enormous sums have been spent, has had the benefit of the commission's fisheries experts who studied the habits and wanderings of the albacore, commonly canned as tuna. Ten years ago a waste product, this "chicken of the sea" is now familiar to nearly every family, and its development into a state resource has cost California not a penny other than the penalty of years of profit lost through not knowing its sterling value earlier.

Fish and game may now be said to stand upon a substantial footing in the south, financially, physically and morally. With the most up-to-date hatchery in the world nearing completion on the eastern slope of the Sierras ready to begin work on next spring's eggs, there is reason to believe all freshwater fish conditions will steadily improve. The steady growth in license income took a sudden and most noteworthy spring this summer, until it would be a bold man indeed who would attempt to predict its total ten years hence; but so long as every unit-increase in the demand brings with it another dollar to defray the cost of additional sport demanded, just so long will that increase be denied any terrors for those whose hope and best wish is ever "more fish to catch, more game to shoot" for all Californians.

Respectfully submitted.

(Signed) EDWIN L. HEDDERLY,
Assistant.

REPORT OF FRESNO DISTRICT OFFICE.

The Honorable Board of Fish and Game Commissioners.

GENTLEMEN: The year 1915 witnessed little change in general conditions with regard to fish and game in the Fresno Division. The policy of the office continued to be along the same lines as in previous years. The office was a central point from which the activities of the deputies were directed and at the same time it was recognized by the public as a friendly cooperative agency alike for the diffusion of information regarding fish and game laws and the aims and ideals of the Fish and Game Commission as well as a receiving point for information from the public on all subjects pertaining to the betterment of conditions with regard to fish and game law enforcement. The active cooperation and confidence of the public throughout the nine counties of the Fresno Division has been the best justification for the establishment of the Fresno office in the first instance.

In the winter months of 1914–15 a determined effort was made to correct conditions existing around the westerly and southerly boundaries of Yosemite National Park. Many deer in previous years have been slaughtered at the time when the snows drive the deer from the protected area of this National Park. By hard and patient work the Fresno office had finally reduced to a minimum, offenses against the deer law in the counties of Kern, Tulare, Fresno and Madera. In former years, large numbers of deer were slaughtered when in a comparatively helpless state in the foothill and lower mountain region. Naturally, the most important feature of protective work for the deer was in securing the cooperation of the mountain people. Although at first antagonistic because the mountaineers had always made a practice of killing deer for the meat, when needed, a condition was brought about gradually whereby in the mountains mentioned the Fish and Game Commission had the almost unanimous support of all the mountain people. The only remaining section of the Fresno Division where the enforcement of the deer law and the sentiment therefor was not general, was that section of the mountains lying as described, just outside of Yosemite National Park. Three picked deputies were sent into the region and remained there throughout the winter months. From all evidence that can be gathered there were practically no deer killed in that section during the past winter. However, the work of the deputies must be followed up for several successive seasons in order to make these improved conditions effective and enduring.

The fish planting operations in the Sierra Nevada Mountains of the Fresno Division have been consistently carried forward and in 1914 the pack horse distribution work reached its climax of magnitude. This work of stocking the barren streams of a vast region with desirable varieties of trout has been of great value and of universal popularity with the public. It should be noted that some experiments of much scientific value have been undertaken which give promise of interesting results. Waters uninhabited by fish have been available for such experiments. Conditions have been favorable for testing the development of steelhead trout fry when planted in waters where the fish can not readily run to the ocean. Other experiments along similar lines to observe what changes, if any, take place in the apparent characteristics of golden trout have been undertaken and these experiments, as well as the steelhead experiment, have been the subject of previous biennial reports from the Fresno office. The time to draw conclusions from these experiments should be ripe in the summer seasons of 1916 and 1917.

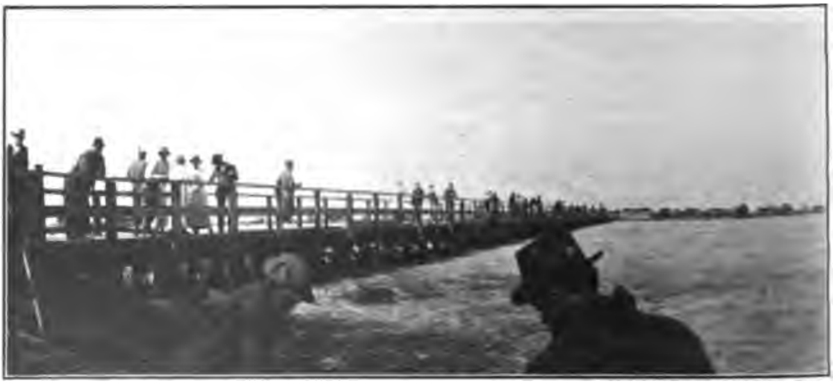


Fig. 86. Fishing for salmon with hook and line on the San Joaquin River at the Miller and Lux weir at Mendota, Fresno County. Photograph by A. D. Ferguson.

The following copies of reports cover the fish planting enterprises of the Fresno office during the seasons 1914 and 1915.

Report Trout Planting 1914.

By reason of the magnitude of the operations, the distances over which the fish were transported and the fact that golden trout alone were used in the transplanting operations, the fish planting by the Fresno office in the summer months of 1914, was the most important undertaking ever inaugurated by that office.

On July 1, 1914, Deputy Ellis left Fresno with a finely equipped pack train of twenty mules, of which fourteen carried fish cans and six carried provisions and horse feed. The fish planting crew consisted of Deputies Ellis, Brownlow, Bullard and Smalley. Later Messrs. Walter Williams, Ray C. Ellis and Tom P. Ferguson were engaged as assistants in connection with the expedition. Mr. D. A. Williams, a well known business man of Fresno, fell in with the expedition at

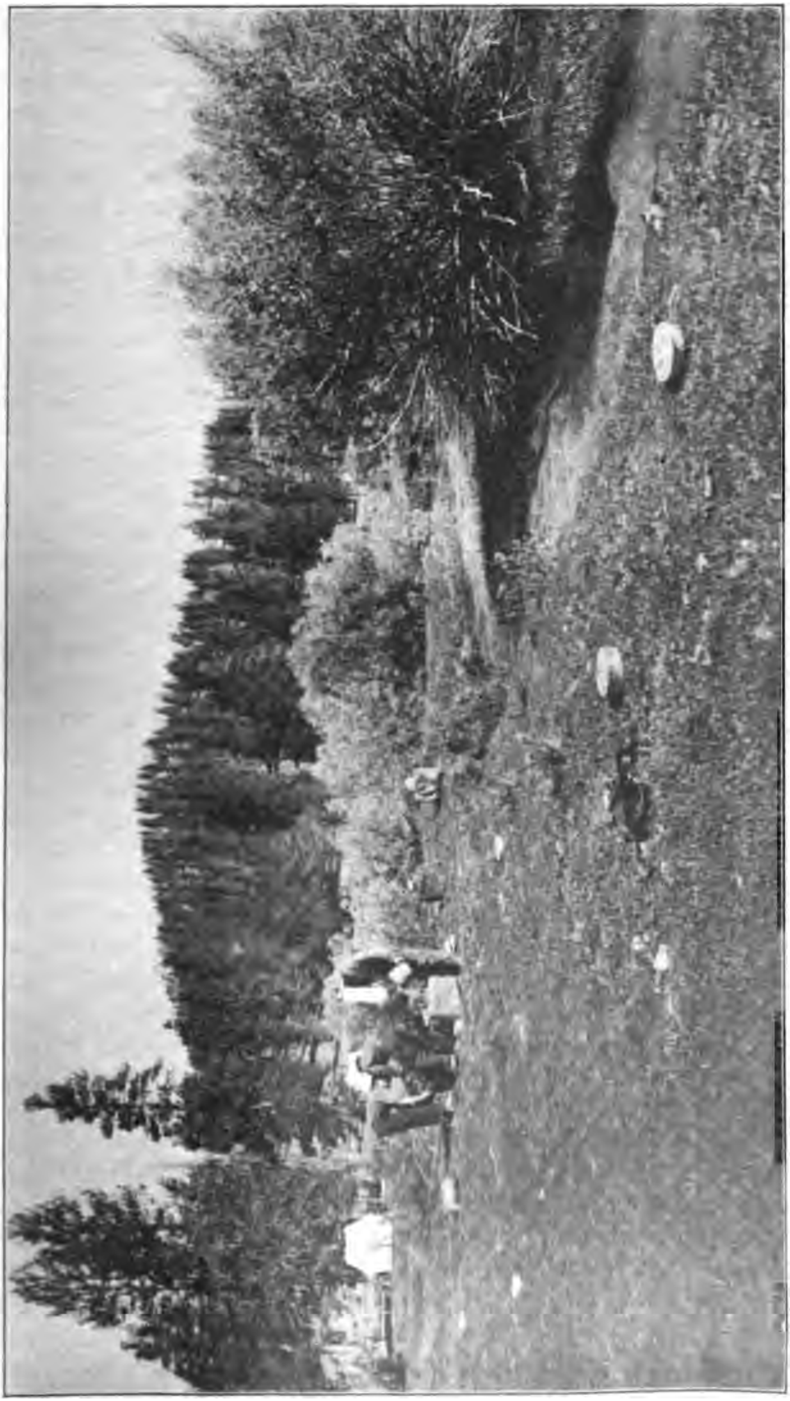


Fig. 87. Golden trout operations. Sorting the fish at Long Meadows preparatory to a pack-horse trip. Photograph by A. D. Ferguson.

Whitney Meadows and donated his volunteer services to assist in taking up fish and in the fish planting operations.

The pack train proceeded to Whitney Meadows and there took up some 2000 adult golden trout. The fish planters then proceeded by trail to Lone Pine, which consumed two days, and thence to Bishop and North Lake, which took four days. While encountering many difficulties, they succeeded in landing the major portion of the fish at a comparatively high altitude at North Lake; where the danger of losses was over. At North Lake the expedition was joined by Paul G. Reddington, forest supervisor of the Sierra National Forest, and A. D. Ferguson, in charge Fresno Division. From North Lake the fourteen mule loads of golden trout were taken across the summit via Piute Pass, crossing on 60 feet of snow, and on to the headwaters of the south fork of the San Joaquin River.

This consignment of fish was planted in the following waters:

Desolation Lake, two unnamed lakes on the south side of Piute Creek, French Canyon Creek, and Piute Creek. Distant two days pack from these localities, plants were made in Heart Lake and Marie Lake, tributary to the south fork of the San Joaquin, and in the headwaters of Bear Creek which is an important tributary of the south fork of the San Joaquin.

Immediately after delivering the golden trout on the headwaters of Piute Creek, Deputy Ellis, accompanied by Ray Ellis and Tom Ferguson, returned with half the pack train to Whitney Meadows for a new supply of golden trout for transplanting, while Deputies Bullard and Brownlow, after stocking Bear Creek and lake waters, took the remaining half of the pack train, by trail, to Mammoth where they awaited a consignment of golden trout which Deputy Ellis was in the meantime gathering at Whitney Meadows. About August 2d, Deputy Ellis and his assistants carried seven mule loads (14 cans) of adult golden trout down to Lone Pine and thence by auto truck to Mammoth, where they were delivered to Deputies Bullard and Brownlow, the former deputies returning at once to Whitney Meadows to secure a further supply. This consignment of fish was planted by Deputies Bullard and Brownlow in the creek at Agnew Meadows, in Shadow Creek, Garnet Lake and Shadow Lake. It had been previously arranged between the Fresno office and the superintendent of Yosemite National Park, that five mule loads of this consignment of golden trout were to be delivered to the park authorities at Thousand Island Lake. Upon arriving at Thousand Island Lake, the deputies of the Fish and Game Commission found evidence that the park pack train had been there but had returned to the park. Accordingly, all of the fish were distributed in waters immediately south of the park line.

By the foregoing operations the range of the golden trout has been extended more than 150 miles along the summit waters of the Sierras from Volcano Creek, the original habitat.

On August 10, 1914, Commissioner Carl Westerfeld and A. D. Ferguson, in charge of the Fresno office, accompanied by Robert Duke, attorney for the commission, joined the pack train at Lone Pine and were with the crew throughout the remainder of the time the expedition was in the field. Deputy Smalley was, because of severe illness, compelled to return home from Bishop, leaving the pack-train crew while on its first trip. From Whitney Meadows as a base of supply, seven plants of golden trout were made in new waters tributary to the upper Big Kern and in small lakes in the vicinity of Mount Genoa and Crag Erricson. An additional plant also was made to the former plant in Lake South American. Commissioner Westerfeld assisted throughout this and subsequent operations not only in taking up the golden trout but in distributing them.

Deputies Bullard and Brownlow having now returned with their string of pack stock to Whitney Meadows, a full pack-train load of golden trout were taken up and the expedition proceeded via Kern River Canyon, Farewell Gap, Mineral King, Timber Gap, Elizabeth Pass, Roaring River, Kings River Canyon and on to the northern slope of the divide between Middle and South Forks of Kings River. En route plants were made in Cliff Creek, tributary to the Kaweah River and Lone Pine Meadow and Tamarack Lake (renamed Lake Westerfeld) on the headwaters of the middle fork of the Kaweah. The party divided at Roaring River. Deputy Bullard, assisted by Walter Williams, with four mule loads of golden trout, completed the season's operations by planting Horse Corral Creek, Lewis Creek and Wildman Creek, tributaries of the south fork of Kings River, and Kennedy Creek with its tributary lakes, and a lake at the head of Lost Canyon, tributary to middle fork of Kings River, situated on the north side of the Monarch Divide which separates the middle and south forks of the river. The expedition was disbanded at Big Meadows in northern Tulare County.

About 5000 adult golden trout were transplanted, all taken with (fly) hook and line. All of the plants were made in ideal barren waters which are located conveniently for further distribution work in still other barren waters as soon as the fish shall have become established. Because of these and previous similar operations in transplanting golden trout, the fear once common that this peerless species might become extinct, is forever allayed.

Late in September a carload of rainbow, eastern brook and Loch Leven trout fry were planted at Huntington Lake.

Report Trout Planting 1915.

The fish planting operations of the Fresno office during the 1915 season were confined to extending to new waters in the same general locality the plants formerly made in an important part of eastern Fresno County.

In the month of August, with a ten-mule pack train, Deputies A. D. Ferguson, in charge of Fresno Division, S. L. N. Ellis and F. A. Bullard proceeded to Dinkey Lake to complete some transplanting work first undertaken in that vicinity several years ago. The expedition was accompanied by Hon. L. B. Cary, chairman of the House Committee on Fish and Game in the legislature of 1915. Mr. Cary was given an opportunity to observe the methods of the Fish and Game Commission in establishing trout in available waters which had been theretofore barren. With rainbow trout and black-spotted trout secured from Psalter Creek, plants were made as follows: In the creek which heads on the divide west of "Mining Town," the streams which feed from various directions, Dinkey Creek, the upper main Dinkey Creek, the stream which comes from Cutts Meadow and the streams which are crossed by the trail from Cutts Meadow to Mining Town; all being tributary to Dinkey Creek.

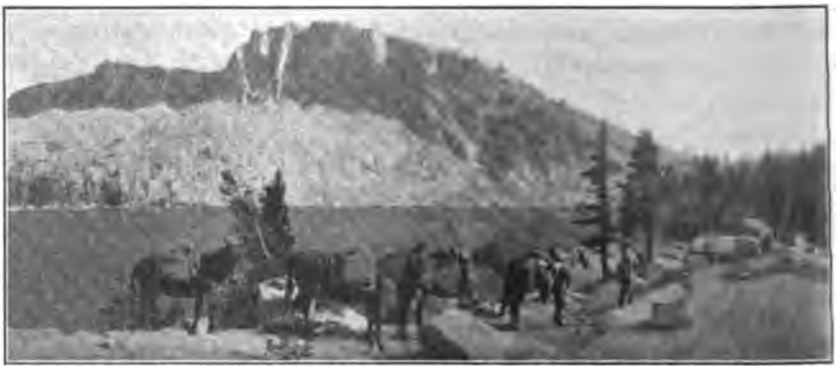


Fig. 88. Deputies of the Fresno Division do fish planting along with patrol duty. Note the cans of fish on mule-back. Photograph by A. D. Ferguson.

Thereafter, with eastern brook trout secured at Dinkey Meadows, where they were planted by Deputy Kenneth Hughes in 1910, the upper waters of the main fork of Dinkey Creek were well stocked.

After finishing the stocking of all the main tributaries of Dinkey Creek, the fish planting operations were transferred to the north fork of Kings River. At upper Maxon's Meadow a plentiful supply of rainbow trout were found, being the result of a plant made in 1910. Drawing on this supply and using fish from 8 to 14 inches in length, the following barren waters were stocked: The lake known as The Devil's Punch Bowl, the south fork of Fleming Creek and two small lakes tributary to said creek, Fall Creek and Baird Creek. Plants were later made in the extreme head of the north fork of Kings River.

After completing these operations the activities of the fish planters were transferred to the vicinity of Helm Creek, stocked in 1910 with eastern brook trout. The creek was found to be alive with these trout. Here adult fish were taken to stock various lakes in that vicinity. That some idea may be gained of the results which follow fish planting in barren waters in the Sierra Nevada Mountains, attention is called to the fact that Deputy Bullard, fishing with "flies," took 110 eastern brook trout from Helm Creek within thirty minutes. These fish were afterwards planted, uninjured, in new waters in that vicinity. Nelson Lake and five other barren lakes tributary to Helm Creek, were also stocked with adult eastern brook trout, this completing the transplanting operations with adult fish.

In September, 26,000 rainbow fry from the Sisson Hatchery were planted by deputies of the Fresno office in the north fork of the San Joaquin River. These fish were taken to the terminus of the wagon road at Bass Lake and thence by pack train to the waters to be stocked.

A carload (100 cans) of rainbow and Loch Leven fry from the Sisson Hatchery, were distributed late in September in Huntington Lake and various streams tributary to Huntington Lake and to Shaver Lake, all being in the mountains of eastern Fresno County.

The Fresno office of the Fish and Game Commission was closed March 1, 1916.

Respectfully submitted.

(Signed) A. D. FERGUSON,
Assistant in Charge Fresno District Office.

APPENDIX

CALIFORNIA FISH AND GAME COMMISSION, ADMINISTRATIVE DISTRICTS.

San Francisco District.

Office: 425 New Call Building, San Francisco.
Phone, Sutter 6100.

Alameda County.
Contra Costa County.
Del Norte County.
Fresno County.
Humboldt County.
Kings County.
Lake County.
Madera County.
Marin County.
Mariposa County.
Mendocino County.
Merced County.
Monterey County.
Napa County.
San Benito County.
San Francisco County.
San Mateo County.
Santa Clara County.
Santa Cruz County.
Sonoma County.
Solano County.
Stanislaus County.
Tuolumne County.
Tulare County.

Sacramento District.

Office: Forum Building, Sacramento.
Phone, Main 4300.

Alpine County.
Amador County.
Butte County.
Calaveras County.
Colusa County.
Eldorado County.
Glenn County.
Lassen County.
Modoc County.
Nevada County.
Placer County.
Plumas County.
Sacramento County.
San Joaquin County.
Shasta County.
Sierra County.
Siskiyou County.
Sutter County.
Tehama County.
Trinity County.
Yuba County.
Yolo County.

Los Angeles District.

Office: 426 Union League Building, Los Angeles.
Phones: Broadway, 1155; Home, F5705.

Imperial County.
Inyo County.
Kern County.
Los Angeles County.
Mono County.
Orange County.
Riverside County.
San Bernardino County.
San Diego County.
San Luis Obispo County.
Santa Barbara County.
Ventura County.

BOARD OF FISH AND GAME COMMISSIONERS.

Roster June 30, 1916.

Commissioners appointed by the Governor, by and with the consent of the Senate. Term at pleasure of the Governor. No compensation.

F. M. Newbert, *President*, Sacramento	Appointed August 3, 1911
M. J. Connell, Los Angeles	Appointed February 1, 1909
Carl Westerfeld, San Francisco	Appointed November 28, 1911
Ernest Schaeffle, *Executive Officer*, San Francisco	First appointed Assistant March 29, 1905. Appointed Executive Officer November 29, 1911.

Head office, San Francisco, 425 Call Building.†

Under direction of Commissioner Carl Westerfeld.

	Date first appointed
Ernest Schaeffle, Executive Officer	March 29, 1905
J. S. Hunter, Assistant Executive Officer	December 1, 1907
A. D. Ferguson, Field Agent	May 1, 1909
R. D. Duke, Attorney	February 6, 1912
John P. Fisher, Chief of License Bureau	May 1, 1915
Daniel O'Connell, Clerk, License Bureau	December 9, 1911
E. C. Boucher, Special Agent	October 1, 1914
O. H. Reichling, Cashier and Bookkeeper	March 26, 1908
H. R. Dunbar, Assistant Cashier and Bookkeeper	December 16, 1912
Leo N. Pettit,* Chief Clerk	May 1, 1901
Mae D. Horn, Stenographer	July 23, 1907
Lida H. Ransom, Stenographer	October 1, 1911

Fishcultural Department.

Hatcheries—Screen and Ladder Investigations—Water Pollution.

W. H. Shebley, In Charge, San Francisco	May 16, 1883
E. W. Hunt, Field Agent, San Francisco	August 10, 1887
G. H. Lambson, Superintendent, Sisson Hatchery	March 1, 1916
F. A. Shebley,* Superintendent, Ukiah and Snow Mt. Hatchery	November 1, 1893
W. O. Fassett,* Superintendent, Ft. Seward Hatchery	April 1, 1896
A. E. Doney, Screen and Ladder Surveyor, San Francisco	March 1, 1905
A. E. Culver, Screen Surveyor, San Francisco	July 1, 1913
A. M. Fairfield,* Water Pollution, San Francisco	August 11, 1906
J. H. Hoerl, Chief Clerk, San Francisco	March 1, 1908
Lillian Ciegler, Stenographer, San Francisco	May 1, 1914
R. W. Requa* (on furlough), Assistant Superintendent, Chico	June 18, 1895

Sisson Hatchery—Sisson.

E. Clessens, Fourth Class Fish Culturist	February 1, 1912
F. Clessens, Carpenter	April 1, 1908
R. Elkins, Temporary Employee	January 17, 1914
A. Hill, Temporary Employee	April 2, 1914
Wm. Heffernan, Watchman	June 7, 1912
G. McCloud, Jr., Fourth Class Fish Culturist	February 9, 1914
J. McManus, Temporary Employee	October 19, 1914
C. Nixon, Third Class Fish Culturist	March 1, 1910
R. A. Pape, Temporary Employee	April 9, 1915
R. Rupp, Pond Watchman	January 1, 1911
J. Sollner, Fourth Class Fish Culturist	July 5, 1913
F. Sullaway, Foreman	October 1, 1911
J. E. Winchcomb, Pond Fish Feeder	August 1, 1911

Distribution Cars.

L. Phillips, Superintendent Car No. 1	January 1, 1912
R. W. Flint, Temporary Employee	April 15, 1916
G. McCloud, Sr., Fourth Class Fish Culturist	July 1, 1913
F. L. Raycraft, Temporary Employee	March 29, 1916
R. I. Bassler, Superintendent Car No. 2	January 1, 1912
A. Mack, Temporary Employee	December 27, 1915
W. H. Pepper,* Temporary Employee	May 16, 1904

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*Employment not continuous.

†February 1, 1916, San Francisco and Fresno districts were consolidated.

Ukiah and Snow Mountain Hatcheries.

	Date first appointed
J. Shebley, Fourth Class Fish Culturist	June 17, 1913

Brookdale Hatchery.

H. L. Nehf, Temporary Hatchery Foreman	February 10, 1915
L. E. Breese, Temporary Employee	February 14, 1915

Scott Creek Station.

R. Mattei, Temporary Assistant Spawn Taker	February 10, 1915

Fort Seward Hatchery.

S. Campbell, Temporary Employee	March 6, 1916

Tahoe Hatcheries.

Clarence Christiansen, Temporary Employee	April 26, 1915
O. W. Dickey, Watchman (Tallac)	February 1, 1915
O. P. Wehrman, Watchman (Tahoe)	November 1, 1913
Geo. Simpson, Temporary Employee	April 15, 1915
G. E. West, Fourth Class Fish Culturist	April 1, 1908

Bear Valley Hatchery.

W. L. Gatchell, Fourth Class Fish Culturist	June 20, 1913
G. L. Morrison, Fourth Class Fish Culturist	May 26, 1913

Inyo County Hatchery.

A. E. Glidden, Fourth Class Fish Culturist	January 15, 1914

Almanor Hatchery.

Jas. H. Vogt, Temporary Employee	October 23, 1915

Commercial Fisheries Department.

N. B. Scofield,* In Charge	Special Fishery Investigation	June 1, 1897
	Fishery Expert	February 21, 1914
H. B. Nidever, Fishery Expert		June 29, 1908
R. B. Heacock, Assistant		May 1, 1907

Bureau of Education, Publicity and Research.

H. C. Bryant, Ph.D.,* In Charge	Research Fellow in Zoology; Special Work	January 1, 1911
	Game Expert	September 1, 1914

Sacramento office, Forum Building.

Under direction of Commissioner F. M. Newbert.

Geo. Neale	Assistant	April 1, 1903
	Assistant in Charge	October 1, 1911
Chas. L. Gilmore, Engineer-Draftsman		June 19, 1912
Geo. T. Hanley, Clerk and Stenographer		February 16, 1914
Leslie Rust, Office Boy		November 1, 1913

Los Angeles office, 426 Union League Building.

Under direction of Commissioner M. J. Connell.

H. I. Pritchard, Assistant In Charge	August 1, 1900
E. L. Hedderly, Assistant Research and Publicity	November 22, 1915
E. A. McKee, Clerk and Stenographer	September 16, 1911

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*Employment not continuous.

LIST OF REGULAR DEPUTIES.

San Francisco District.

Alameda County.

Name and headquarters.	Date first appointed
J. L. Bundock, Oakland	September 1, 1910
Earle Downing, Pleasanton	August 27, 1908

Del Norte County.

H. S. Prescott, Crescent City	August 16, 1915

Fresno County.

S. L. N. Ellis, Fresno	May 1, 1909
F. A. Bullard, Dunlap	February 1, 1912
Tipton Mathews, Coalinga	October 6, 1911

Humboldt County.

Earl P. Barnes, Eureka	May 1, 1911
Theo. M. Benson, Fortuna	October 1, 1911

Kings County.

E. W. Smalley, Hanford	May 1, 1909

Marin County.

D. H. Hoen, San Rafael	September 23, 1910

Mendocino County.

B. H. Miller, Ukiah	July 1, 1908
Chas. R. Perkins, Fort Bragg	June 15, 1912
John H. Hellard, Laytonville	July 17, 1915

Merced County.

R. S. Kimball, Merced	October 22, 1914

Monterey County.

P. H. Oyer, Pacific Grove	May 1, 1913
Frank Shook, Salinas	November 15, 1907

Napa County.

W. J. Moore, Napa	September 1, 1907

San Francisco County.

M. S. Clark, San Francisco	August 20, 1911
Ed. Boyle, San Francisco	August 13, 1913
J. W. Gallaway (Launch "Barracuda"), San Francisco	October 1, 1914
H. H. Hunt, San Francisco	October 1, 1914

San Mateo County.

John Burke, Colma	July 1, 1915

Santa Clara County.

I. L. Koppel, San Jose	August 1, 1909

Santa Cruz County.

J. H. Hill, Watsonville	December 13, 1907
T. F. Maloney, Santa Cruz	October 1, 1914

Sonoma County.

A. F. Lea, Cloverdale	April 25, 1903
Henry Lencioni, Santa Rosa	February 15, 1910
Paul Smith, Guerneville	June 15, 1912

Solano County.

W. H. Armstrong, Vallejo	April 1, 1907

Name and headquarters.	Date first appointed
Stanislaus County.	
J. E. Newsome, Newman	December 1, 1906
Tuolumne County.	
Geo. F. Grant, Columbia	February 2, 1914
Tulare County.	
O. P. Brownlow, Porterville	July 1, 1914
Launch "Quinnat."	
H. E. Foster, Vallejo	April 15, 1912
Chas. M. Bouton, Vallejo	January 1, 1916

Sacramento District.

Amador County.	
Frank S. Parke, Sutter Creek	January 10, 1912
Calaveras County.	
Dr. D. E. Roberts, Murphys	October 1, 1911
Colusa County.	
S. J. Carpenter, Maxwell	October 1, 1910
El Dorado County.	
Euell Gray, Placerville	September 1, 1911
Lassen County.	
Frank P. Cady, Susanville	November 15, 1909
Modoc County.	
Geo. W. Courtright, Canby	October 25, 1912
Nevada County.	
R. C. O'Connor, Grass Valley	November 17, 1910
J. H. Sanders, Truckee	May 1, 1916
Placer County.	
Chester Scroggs, Loomis	August 17, 1911
Plumas County.	
L. J. Warren, Taylorsville	October 1,1914
Sacramento County.	
C. H. Biemer, Sacramento	January 29, 1912
W. J. Green, Sacramento	November 1, 1911
San Joaquin County.	
Albert Tracy (Launch), Stockton	March 4, 1916
Richard Squire, Lodi	October 1, 1910
Shasta County.	
J. S. White, Castella	October 1, 1908
Siskiyou County.	
J. W. Harris, Greenview	July 1, 1913
L. A. Streuber, Gazelle	October 1, 1914
Sutter County.	
E. D. Ricketts, Live Oak	October 1, 1910
Tehama County.	
T. W. Birmingham, Red Bluff	September 11, 1903
Trinity County.	
G. O. Laws, Weaverville	February 1, 1908
Yolo County.	
R. L. Sinkey, Woodland	December 1, 1911

Los Angeles District.

Name and headquarters	Date first appointed
Inyo County.	
E. H. Ober, Big Pine	September 15, 1908
Kern County.	
A. J. Stout, Bakersfield	April 1, 1914
Los Angeles County.	
H. D. Becker, Los Angeles	October 1, 1914
Orange County.	
W. K. Robinson (on furlough), El Toro	October 25, 1909
Riverside County.	
Jas. H. Gyger, Elsinore	October 4, 1911
San Bernardino County.	
W. C. Malone, San Bernardino	February 1, 1916
San Diego County.	
Webb Toms, San Diego	April 1, 1907
A. T. Norton, (Crawfish Inspector), San Diego	February 11, 1913
San Luis Obispo County.	
C. S. Bauder, San Luis Obispo	October 1, 1914
Santa Barbara County.	
H. J. Abels, Santa Maria	August 1, 1905
Ventura County.	
J. J. Barnett, Ventura	January 19, 1914

Hayward Game Farm.

W. N. Dirks, Superintendent	December 15, 1911

INVENTORY OF STATE PROPERTY—FISH AND GAME COMMISSION DECEMBER 31, 1915.

Recapitulation.

Office equipment, San Francisco	$3,051 76	
Assistants' equipment, San Francisco District	269 45	
Store-room at Ferry, San Francisco	193 65	
		$3,514 86
Office equipment, Sacramento	$743 75	
Assistants' equipment, Sacramento District	576 90	
		1,320 65
Office equipment, Los Angeles	$537 45	
Assistants' equipment, Los Angeles District	92 00	
		629 45
Office equipment, Fresno*	$765 20	
Assistants' equipment, Fresno District	22 65	
		787 85
Scientific investigation		518 45
Game Farm, Hayward—Including cottage, tank-house, pond, equipment and stock		7,001 20
Launch "Quinnat" and equipment	$4,543 55	
Launch "Shad" and equipment	825 84	
Launch "Audubon" and equipment	229 08	
Launch "Barracuda" and equipment	799 92	
		6,398 39
Sisson Hatchery, including fish distribution car and equipment, buildings, ponds and furnishings		46,344 97

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*Office closed February 1, 1916, and property moved to San Francisco office.

Klamath River Stations.

Bogus Creek	$419 45		
Camp Creek	255 45		
Gottville	150 00		
Ferry	3 50		
Shovel Creek	38 40		
Copco	50 00		
		916 80	
Burney Creek Station		578 65	

Tahoe Hatcheries.

Tahoe City	$9,823 80		
Tallac	5,276 19		
Glen Alpine	30 40		
		15,130 39	
Price Creek Hatchery†	$ 3,633 85		
Brookdale Hatchery	17 05		
Scott Creek Station	19 95		
Ukiah Hatchery	84 95		
Snow Mountain Station	1,003 34		
Bear Valley Hatchery	93 00		
Marlett Lake Hatchery	3 40		
		4,855 54	
			$87,997 20

SISSON HATCHERY.

Fish Distribution by Counties. Season 1914.

ALAMEDA COUNTY.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
Earle Downing	June 9	Stony Brook	12,000
Earle Downing	June 9	Alameda Creek	18,000
Earle Downing	June 9	Trout Creek	4,000
Earle Downing	June 9	Arroyo Bayo	24,000
Earle Downing	June 9	Trout Creek	9,000
Earle Downing	June 9	Mocho Creek	18,000
Earle Downing	June 9	Livermore Creek	6,000
Earle Downing	June 9	Cedar Mountain Creek	3,000
Earle Downing	June 9	San Lorenzo River	15,000
Earle Downing	June 9	Keiser Creek	9,000
Earle Downing	June 9	Palmores Creek	36,000
Earle Downing	June 9	Bellinas Creek	6,000
Earle Downing	June 9	Crow Creek	18,000
Earle Downing	June 9	Zeile Creek	9,000
Earle Downing	June 9	Alameda Creek	15,000
Earle Downing	June 9	La Costa Creek	15,000
Earle Downing	June 9	Indian Creek	9,000
Earle Downing	June 9	Calaveras Creek	12,000
Earle Downing	June 9	Apperson Creek	9,000
		Total	247,000

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†Moved to Fort Seward Hatchery February 1, 1916.

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

ALPINE COUNTY.

Distribution of Black Spotted Trout.

Applicant	Date	Water stocked	Number
Grant P. Merrill	Sept. 9	Silver Creek	9,000
Grant P. Merrill	Sept. 9	Pleasant Valley Creek	6,000
Grant P. Merrill	Sept. 9	West Fork of Carson	15,000
Chas. Tryson	Sept. 9	North Fork of Mokelumne River	12,000
Chas. Tryson	Sept. 9	Highland Creek	12,000
		Total	54,000

Distribution of Loch Leven Trout.

Applicant	Date	Water stocked	Number
Grant P. Merrill	Sept. 9	Hot Spring Creek	6,000
Grant P. Merrill	Sept. 9	West Fork of Carson	14,000
		Total	20,000

AMADOR COUNTY.

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
W. G. Snyder	Sept. 24	Mokelumne River	2,000
W. G. Snyder	Sept. 24	Mill Creek	2,000
W. G. Snyder	Sept. 24	Tiger Creek	2,000
W. G. Snyder	Sept. 24	Antelope Creek	2,000
G. C. Bruce	Sept. 24	North Fork of Mokelumne River	4,000
G. C. Bruce	Sept. 24	Blue Creek	4,000
		Total	16,000

Distribution of Eastern Brook Trout.

Applicant	Date	Water stocked	Number
Sutter Creek Fish Club	Sept. 24	Sutter Creek	10,000

Distribution of Loch Leven Trout.

Applicant	Date	Water stocked	Number
Sutter Creek Fish Club	Sept. 24	Sutter Creek	14,000

Distribution of Black Spotted Trout.

Applicant	Date	Water stocked	Number
W. G. Snyder	Sept. 24	Mokelumne River	3,000
W. G. Snyder	Sept. 24	Mill Creek	3,000
W. G. Snyder	Sept. 24	Tiger Creek	3,000
W. G. Snyder	Sept. 24	Antelope Creek	3,000
Jackson Merchants Assn.	Sept. 24	Mill Creek	12,000
Jackson Merchants Assn.	Sept. 24	Panther Creek	12,000
Jackson Merchants Assn.	Sept. 24	Tiger Creek	12,000
S. D. Calvin	Sept. 24	Mill Creek	6,000
S. D. Calvin	Sept. 24	Tiger Creek	6,000
G. C. Bruce	Sept. 24	North Fork of Mokelumne River	6,000
G. C. Bruce	Sept. 24	Blue Creek	6,000
		Total	72,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

BUTTE COUNTY.

Distribution of Black Spotted Trout.

Applicant	Date	Water stocked	Number
Leonard Terrell	July 2	Philbrook	15,000
Clay Buchanan	July 2	West Branch Feather River	3,000
Clay Buchanan	July 2	Rebsen Ravine	6,000
Clay Buchanan	July 2	Cole Canyon	6,000
Bert F. Kauffman	July 2	North Fork of West Branch of Feather River	30,000
W. J. Whittier	July 2	North Fork of West Branch of Feather River	21,000
F. M. Thatcher	July 2	North Fork of West Branch of Feather River	24,000
A. J. Hanley	July 2	West Branch of Feather River	4,000
A. J. Hanley	July 2	Butte Creek	6,000
William Oabberlin	Aug. 20	Berry Creek	12,000
Butte Meadows Fishing Club	Sept. 18	Willow Creek	12,000
Butte Meadows Fishing Club	Sept. 18	Colby Creek	12,000
		Total	151,000

Distribution of Loch Leven Trout.

Applicant	Date	Water stocked	Number
Leonard Terrell	July 2	Philbrook	8,000
Clay Buchanan	July 2	West Branch of Feather River	10,000
Lee Richardson	Aug. 30	Mud Creek	14,000
Al. Lindquist	Sept. 8	Little Chico Creek	12,000
Butte Meadows Fishing Club	Sept. 18	Butte Creek	16,000
Annie E. K. Bidwell	Sept. 18	Chico Creek	20,000
		Total	80,000

Distribution of Eastern Brook Trout.

Applicant	Date	Water stocked	Number
W. J. Whittier	July 2	North Fork of West Branch of Feather River	8,000
A. J. Hanley	July 2	West Branch of Feather River	10,000
A. J. Hanley	July 2	Butte Creek	5,000
J. C. Carter	July 2	Big Chico Creek	24,000
Butte Meadows Fishing Club	Sept. 18	Bull Creek	8,000
		Total	55,000

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
Bert F. Kauffman	July 2	North Fork of West Branch of Feather River	10,000
W. J. Whittier	July 2	North Fork of West Branch of Feather River	10,000
F. M. Thatcher	July 2	North Fork of West Branch of Feather River	20,000
W. E. Kemf	July 2	Big Chico Creek	10,000
William Oabberlin	Aug. 20	Berry Creek	8,000
		Total	58,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

CALAVERAS COUNTY.

Distribution of Black Spotted Trout.

Applicant	Date	Water stocked	Number
T. W. Taylor	Sept. 24	South Fork of Mokelumne River	18,000
Claude T. Smith	Sept. 24	North Fork of Mokelumne River	9,000
Claude T. Smith	Sept. 24	Bear Creek	9,000
P. S. Peek	Sept. 24	South Fork of Mokelumne River	9,000
P. S. Peek	Sept. 24	Esperanza Creek	9,000
		Total	54,000

Distribution of Loch Leven Trout.

T. W. Taylor	Sept. 24	Licking Fork of Mokelumne River	10,000
Sam E. Redmond	Nov. 12	North Fork of Stanislaus River	2,000
Ben Stephens	Nov. 12	O'Neal's Creek	4,000
M. P. Avery	Nov. 12	San Antone Creek	4,000
		Total	20,000

Distribution of Rainbow Trout.

T. W. Taylor	Sept. 24	South Fork of Mokelumne River	6,000
Claude T. Smith	Sept. 24	Middle Fork of Mokelumne River	4,000
Claude T. Smith	Sept. 24	North Fork of Mokelumne River	4,000
P. S. Peek	Sept. 24	South Fork of Mokelumne River	8,000
Sam E. Redmond	Nov. 12	North Fork of Stanislaus River	2,000
Ben Stephens	Nov. 12	San Antone Creek	4,000
M. P. Avery	Nov. 12	San Antone Creek	4,000
		Total	32,000

COLUSA COUNTY

Distribution of Rainbow Trout.

Lovelace & Karrth	July 29	North Fork of Stony Creek	6,000
A. C. Kaufman	Nov. 16	Little Stony Creek	4,000
		Total	10,000

Distribution of Loch Leven Trout.

Lovelace & Karrth	July 29	Middle Fork of Stony Creek	6,000
Lovelace & Karrth	July 29	Paradise Creek	4,000
A. C. Kaufman	Nov. 16	Little Stony Creek	20,000
		Total	30,000

DEL NORTE COUNTY.

Distribution of Quinnat Salmon.

Fish and Game Com.	May 1	Smith's River	100,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

EL DORADO COUNTY.

Distribution of Bass.

Applicant	Date	Water stocked	Number
F. G. Warner and D. M. Stevenson	Aug. 21	North Fork of Cosumnes River	50

Distribution of Loch Leven Trout.

Applicant	Date	Water stocked	Number
R. E. Granlees	Sept. 14	Trout Creek	4,000
Tait & Mann	Sept. 14	Tallac Creek	8,000
J. W. S. Buttler	Sept. 14	Echo Lake	12,000
Ralph L. Colwell	Sept. 19	Rock Bound Lake	10,000
Glen Alpine Springs	Sept. 19	Half Moon Lake	6,000
Glen Alpine Springs	Sept. 19	Heather Lake	4,000
Glen Alpine Springs	Sept. 19	Grass Lake	2,000
Glen Alpine Springs	Sept. 19	Lost Lake	2,000
Nelson L. Salter	Sept. 19	Granite Lake	4,000
Euell Gray	Nov. 11	American River	6,000
Euell Gray	Nov. 11	Cosumnes River	14,000
		Total	72,000

Distribution of Eastern Brook Trout.

Applicant	Date	Water stocked	Number
F. J. Pomin	Sept. 14	Richardson Lake	8,000
R. E. Granlees	Sept. 14	Trout Creek	4,000
Tait & Mann	Sept. 14	Little Truckee River	8,000
James Bryson	Sept. 14	South Fork of American River	12,000
J. W. S. Buttler	Sept. 14	Echo Lake	8,000
Ralph L. Colwell	Sept. 19	Rock Bound Lake	8,000
Glen Alpine Springs	Sept. 19	Heather Lake	2,000
Glen Alpine Springs	Sept. 19	Grass Lake	6,000
Glen Alpine Springs	Sept. 19	Lucile Lake	2,000
Glen Alpine Springs	Sept. 19	Margery Lake	2,000
Nelson L. Salter	Sept. 19	Eagle Lake	3,000
Nelson L. Salter	Sept. 19	Eagle Creek	1,000
Murphy Bros. & Morgan	Sept. 19	Hank Richardson Creek	10,000
Euell Gray	Nov. 11	American River	50,000
		Total	124,000

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
F. J. Pomin	Sept. 14	Richardson Lake	8,000
Tait & Mann	Sept. 14	Fallen Leaf Lake	4,000
Ralph L. Colwell	Sept. 19	Rubicon River	6,000
Glen Alpine Springs	Sept. 19	Half Moon Lake	2,000
Glen Alpine Springs	Sept. 19	Heather Lake	2,000
Glen Alpine Springs	Sept. 19	Grass Lake	4,000
Murphy Bros. & Morgan	Sept. 19	Buck Lake	8,000
Euell Gray	Nov. 11	American River	30,000
		Total	64,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

FRESNO COUNTY.

Distribution of Eastern Brook Trout.

Applicant	Date	Water stocked	Number
Hall & McAfee	Sept. 1	South Fork of Kings River	8,000
W. H. Tower	Sept. 30	Pitman Creek	4,000
San Joaquin and Eastern Railroad	Sept. 30	Huntington Lake	90,000
		Total	102,000

Distribution of Rainbow Trout.

W. H. Trowes	Sept. 30	Balsam Creek	4,000
San Joaquin and Eastern Railroad	Sept. 30	Huntington Lake	50,000
		Total	54,000

Distribution of Loch Leven Trout.

Hall & McAfee	Sept. 1	South Fork of Kings River	8,000
W. H. Trowes	Sept. 1	Big Creek	8,000
San Joaquin and Eastern Railroad	Sept. 30	Huntington Lake	44,000
		Total	60,000

GLENN COUNTY.

Distribution of Rainbow Trout.

B. H. Mace	July 29	Elk Creek	2,000
B. H. Mace	July 29	Salt Creek	6,000
		Total	8,000

Distribution of Eastern Brook Trout.

B. H. Mace	July 29	Elk Creek	6,000
B. H. Mace	July 29	Salt Creek	10,000
		Total	16,000

Distribution of Loch Leven Trout.

B. H. Mace	July 29	Elk Creek	10,000
B. H. Mace	July 29	Salt Creek	6,000
		Total	16,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

INYO COUNTY.

Distribution of Eastern Brook Trout.

Applicant	Date	Water stocked	Number
D. M. Nicoll	Sept. 1	Lone Pine Creek	10,000
Roscoe Parkinson	Sept. 1	Lone Pine Creek	10,000
		Total	20,000

Distribution of Loch Leven Trout.

Hall & McAfee	Sept. 1	Big Pine Creek	4,000
Hall & McAfee	Sept. 1	Birch Creek	2,000
Hall & McAfee	Sept. 1	Baker Creek	2,000
D. M. Nicoll	Sept. 1	Tuttle Creek	10,000
Roscoe Parkinson	Sept. 1	Lone Pine Creek	10,000
		Total	28,000

Distribution of Black Spotted Trout.

Hall & McAfee	Sept. 1	Big Pine Lake	6,000
Hall & McAfee	Sept. 1	Little Pine Lake	6,000
D. M. Nicoll	Sept. 1	Halwee Reservoir (public)	18,000
D. M. Nicoll	Sept. 1	Richtes Creek	12,000
Roscoe Parkinson	Sept. 1	Lone Pine Lakes	16,000
Roscoe Parkinson	Sept. 1	Tuttle Creek	14,000
		Total	72,000

KERN COUNTY.

Distribution of Sunfish.

Chanslor Canfield Oil Co.	Oct. 17	Reservoir at Fellows	25

Distribution of Loch Leven Trout.

R. R. Martin	Aug. 30	Alder Creek	4,000
L. P. Allen	Aug. 31	Erskine Creek	2,000
W. W. Laidley	Oct. 9	Rancherie Creek	4,000
Kern River Trout Club	Oct. 9	Cedar Creek	10,000
Kern River Trout Club	Oct. 9	Poso Creek	6,000
		Total	26,000

Distribution of Eastern Brook Trout.

Kern River Trout Club	Oct. 9	Cedar Creek	5,000
Kern River Trout Club	Oct. 9	Lumbro Creek	9,000
		Total	14,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
R. R. Martin	Aug. 30	Alder Creek	4,000
L. P. Allen	Aug. 31	Erskine Creek	2,000
W. W. Laidley	Oct. 9	Rancherie Creek	4,000
Kern River Trout Club	Oct. 9	Cedar Creek	8,000
		Total	18,000

LAKE COUNTY.

Distribution of Steelhead Trout.

E. W. Schwartz	July 25	Kelsey Creek	12,000

Distribution of Loch Leven Trout.

E. W. Schwartz	July 25	Kelsey Creek	24,000
Allen Springs Club	July 25	Bartlett Creek	8,000
		Total	32,000

Distribution of Rainbow Trout.

Allen Springs Club	July 25	North Fork Cache Creek	8,000

LASSEN COUNTY.

Distribution of Black Spotted Trout.

Frank P. Cady	Oct. 4	Susan River	30,000
Red River Lumber Co.	Oct. 4	Hamilton Branch, North Fork Feather River	5,000
Red River Lumber Co.	Oct. 4	Rock Creek	4,000
Red River Lumber Co.	Oct. 4	Robbers Creek	6,000
		Total	45,000

Distribution of Loch Leven Trout.

Frank P. Cady	Oct. 4	Susan River	2,000
Frank P. Cady	Oct. 4	Eagle Lake	10,000
Frank P. Cady	Oct. 4	Butte Lake	8,000
Ray C. Bogart	Oct. 4	Hamilton Branch, North Fork Feather River	20,000
Red River Lumber Co.	Oct. 4	Robbers Creek	10,000
		Total	50,000

Distribution of Rainbow Trout.

Frank P. Cady	Oct. 4	Susan River	8,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

LOS ANGELES COUNTY.

Distribution of Sunfish.

Applicant	Date	Water stocked	Number
J. A. Crane	Nov. 5	Little Matthewson Lake	100

Distribution of Bass.

Applicant	Date	Water stocked	Number
Los Angeles Dept. Public Service	Oct. 18	Dry Canyon Reservoir	150
H. W. O'Melveny	Nov. 5	Reservoir	100
		Total	250

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
G. E. Little	Oct. 29	San Jose Creek	3,000
G. E. Little	Oct. 29	Mission Creek	3,000
G. E. Little	Oct. 29	Lower waters of San Gabriel	6,000
H. W. O'Melveny	Nov. 5	San Gabriel River	30,000
		Total	42,000

Distribution of Loch Leven Trout.

Applicant	Date	Water stocked	Number
H. W. O'Melveny	Nov. 5	San Gabriel River	20,000

Distribution of Eastern Brook Trout.

Applicant	Date	Water stocked	Number
W. J. Sanborn	Oct. 18	Bear Canyon	8,000

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
William G. Kerckhoff	Oct. 18	San Antonio Creek	10,000
O. L. Roberts	Nov. 5	Big Santa Anita	2,000
O. L. Roberts	Nov. 5	Winter Creek	2,000
O. L. Roberts	Nov. 5	East Fork of Big Santa Anita	4,000
H. W. O'Melveny	Nov. 5	San Gabriel River	80,000
		Total	98,000

MARIN COUNTY.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
Cal. Anglers' Association	Aug. 2	Olema Creek	30,000
Cal. Anglers' Association	Aug. 2	Paper Mill Creek	45,000
Cal. Anglers' Association	Aug. 2	Lake Lagunitas	37,500
W. Gaston Donieque	Aug. 2	Frank Valley Creek	10,000
W. Gaston Donieque	Aug. 2	Sheep Ravine Creek	5,000
		Total	127,500

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

Distribution of Loch Leven Trout.

Applicant	Date	Water stocked	Number
Cal. Anglers' Association	Aug. 2	Lake Lagunitas	30,000

Distribution of Eastern Brook Trout.

Con. Roman	Aug. 2	Obeda Creek	2,000

MARIPOSA COUNTY.

Distribution of Black Spotted Trout.

Cal. Anglers' Association	Oct. 13	Moss Canyon Creek	25,000
Cal. Anglers' Association	Oct. 13	Crane Creek	50,000
Cal. Anglers' Association	Oct. 13	Bridal Vail Creek	30,000
		Total	105,000

Distribution of Loch Leven Trout.

Jno. S. Washburn	Oct. 9	South Fork of Merced River	6,000
Jno. S. Washburn	Oct. 9	Two lakes, about twenty miles east of Wawona	4,000
Edwin T. Huffman	Oct. 9	Miami Creek	8,000
Cal. Anglers' Association	Oct. 13	Moss Canyon Creek	20,000
Cal. Anglers' Association	Oct. 13	Bridal Veil Creek	30,000
Cal. Anglers' Association	Oct. 13	Yosemite Creek	30,000
Yosemite Valley R. R. Co.	Oct. 13	Merced River	33,000
		Total	131,000

Distribution of Eastern Brook Trout.

Yosemite Valley R. R. Co.	Oct. 13	Merced River	10,000

Distribution of Rainbow Trout.

Edwin T. Huffman	Oct. 9	Miami Creek	4,000
Yosemite Valley R. R. Co.	Oct. 13	Merced River	4,000
		Total	8,000

MENDOCINO COUNTY.

Distribution of Steelhead Trout.

Cal. Western R. R.	July 7	Pudding Creek	30,000
Cal. Western R. R.	July 8	Noyo River	240,000
J. W. Lowell and W. M. Standley	July 8	Jaun Creek	25,000
		Total	295,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

MERCED COUNTY.

Distribution of Catfish.

Applicant	Date	Water stocked	Number
Joseph Paxton	Oct. 17	Reservoir	35

MODOC COUNTY.

Distribution of Black Spotted Trout.

Jesse Parman	Aug. 20	Emerson Creek	6,000
C. G. Spargur	Aug. 20	South Fork of Pit River	3,000
F. W. Caldwell	Aug. 20	Thomas Creek	3,000
J. T. Spaulding	Aug. 20	Thomas Creek	12,000
W. H. Flournoy	Aug. 20	South Fork of Pit River	3,000
James Thomas	Aug. 20	Big Doby Reservoir	3,000
James Poindexter	Aug. 20	Davis Creek	12,000
John Wall	Aug. 20	Goose Lake	9,000
T. F. Donnaway	Aug. 20	Goose Lake	6,000
		Total	57,000

Distribution of Loch Leven Trout.

Jesse Parman	Aug. 20	Eagle Creek	4,000
C. G. Spargur	Aug. 20	South Fork of Pit River	4,000
F. W. Caldwell	Aug. 20	Thomas Creek	2,000
J. T. Spaulding	Aug. 20	Thomas Creek	4,000
W. H. Flournoy	Aug. 20	South Fork of Pit River	4,000
James Thomas	Aug. 20	Big Doby Reservoir	4,000
James Poindexter	Aug. 20	Davis Creek	4,000
T. F. Donnaway	Aug. 20	Goose Lake	4,000
L. H. Sisson	Aug. 20	East Creek	6,000
Omar Camtrall	Aug. 20	Fitzhugh Creek	4,000
		Total	40,000

Distribution of Eastern Brook Trout.

Grover Wimer	Aug. 20	Mill Creek	4,000
James Thomas	Aug. 20	Big Doby Reservoir	4,000
Omar Cantrall	Aug. 20	Fitzhugh Creek	4,000
		Total	12,000

Distribution of Rainbow Trout.

C. G. Spargur	Aug. 20	South Fork of Pit River	4,000
L. H. Sisson	Aug. 20	East Creek	2,000
		Total	6,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

MONTEREY COUNTY.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
J. L. D. Roberts	June 17	Carmel River	60,000
J. L. D. Roberts	June 17	Dand Creek	3,000
J. L. D. Roberts	June 17	Sobrauns Creek	3,000
J. L. D. Roberts	June 17	Garrapatis Creek	6,000
J. L. D. Roberts	June 17	Rocky Creek	12,000
J. L. D. Roberts	June 17	Mill Creek	12,000
J. L. D. Roberts	June 17	Little Sur River	24,000
J. L. D. Roberts	June 17	Big Sur	15,000
A. H. Abbott	June 14	Arroyo Seco	15,000
T. P. Joy	Oct. 29	Mud Creek	3,000
T. P. Joy	Oct. 29	Gabilan Creek	9,000
		Total	162,000

Distribution of Loch Leven Trout.

S. E. Whitcher	Oct. 29	Horse Canyon Creek	6,000
S. E. Whitcher	Oct. 29	Pajaro River	6,000
S. E. Whitcher	Oct. 29	Piney Creek	2,000
S. E. Whitcher	Oct. 29	Arroyo Seco	2,000
		Total	16,000

NAPA COUNTY.

Distribution of Steelhead Trout.

West & Keyser	July 25	Napa Creek	37,500
C. H. Drake	July 25	Richie Creek	30,000
City of Vallejo	July 25	Lake Madigan	60,000
J. E. Beard	July 25	Rector Canyon	25,000
J. P. Orr	July 25	Soscol Creek	15,000
Clifford Clark	July 29	Capell Creek	18,000
Clifford Clark	July 29	Trout Creek	18,000
		Total	203,500

Distribution of Loch Leven Trout.

City of Vallejo	Oct. 25	Lake Fry	22,000
L. A. Pritchard	Oct. 25	Small lakes	4,000
		Total	26,000

Distribution of Eastern Brook Trout.

L. A. Pritchard	July 25	Small lakes	4,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

NEVADA COUNTY.

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
S. F. Fly Casting Club	Sept. 8	Truckee River	12,000
Boca Mill Co.	Sept. 8	Little Truckee River	16,000
Truckee Chamber of Com.	Sept. 19	Mill Pond, Truckee River	6,000
Grass Val. Sportsman Club	Oct. 2	Bear River	16,000
Grass Val. Sportsman Club	Oct. 2	Indian Canyon	4,000
Grass Val. Sportsman Club	Oct. 2	Haas Lake	2,000
Grass Val. Sportsman Club	Oct. 2	South Yuba River	8,000
		Total	64,000

Distribution of Eastern Brook Trout.

S. McKay	July 19	Juniper Creek	6,000
Boca Mill Co.	Sept. 8	Juniper Creek	10,000
Pacific Gas and Elec. Co.	Sept. 13	Fordyce Creek	7,000
Pacific Gas and Elec. Co.	Sept. 13	South Yuba River	7,000
Truckee Chamber of Com.	Sept. 13	Mardis Creek	14,000
Grass Val. Sportsman Club	Oct. 2	Shebley's Creek	4,000
Grass Val. Sportsman Club	Oct. 2	Upper Wolf Creek	4,000
Grass Val. Sportsman Club	Oct. 2	Rattlesnake Creek	4,000
Grass Val. Sportsman Club	Oct. 2	Squirrel Creek	4,000
Grass Val. Sportsman Club	Oct. 2	South Yuba River	14,000
		Total	74,000

Distribution of Loch Leven Trout.

S. F. Fly Casting Club	Sept. 8	Truckee River	16,000
Pacific Gas and Elec. Co.	Sept. 13	Bloody River	20,000
Truckee Chamber of Com.	Sept. 19	Donner Creek	8,000
		Total	44,000

Distribution of Black Spotted Trout.

E. J. Rees	Sept. 8	Crystal Lake	15,000
Pacific Gas and Elec. Co.	Sept. 13	Fordyce Creek	25,000
Pacific Gas and Elec. Co.	Sept. 13	South Yuba River	20,000
		Total	60,000

ORANGE COUNTY.

Distribution of Steelhead Trout.

W. K. Robinson	Nov. 5	Lower Trebuco	6,000
F. A. Foster	Nov. 6	San Juan	18,000
		Total	24,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
W. K. Robinson	Nov. 5	Silverado Creek	4,000
W. K. Robinson	Nov. 5	Santiago Creek	4,000
W. K. Robinson	Nov. 5	Upper Trebuco	4,000
W. K. Robinson	Nov. 5	Upper Trebuco	2,000
F. A. Foster	Nov. 6	San Juan	4,000
		Total	18,000

PLACER COUNTY.

Distribution of Sunfish.

L. G. Merrithew	Aug. 23	Powers Lake	100

Distribution of Black Spotted Trout.

J. G. Dodds	Sept. 8	Secret Canyon	12,000

Distribution of Loch Leven Trout.

H. M. Freeman	July 19	Loch Leven Lakes	16,000
H. M. Freeman	Sept. 8	South Yuba River	4,000
D. M. Ray and G. H. Smith	Sept. 8	North Fork of Middle Fork of North Fork of American River	4,000
D. M. Ray and G. H. Smith	Sept. 8	Grouse Canyon	2,000
J. G. Dodds	Sept 8	Secret Canyon	8,000
Lake Tahoe Railway and Transportation Co.	Sept. 14	Truckee River	12,000
Scott Bros.	Sept. 14	Silver Creek	2,000
Scott Bros.	Sept. 14	Squaw Creek	6,000
W. J. McCleary	Sept. 18	Brushy Canyon	8,000
		Total	62,000

Distribution of Eastern Brook Trout.

S. McKay	July 19	Klondyke Creek	6,000
H. M. Freeman	July 19	South Yuba River	10,000
S. H. Cavitt	July 19	Martis Creek	10,000
William Ewer	July 19	Canyon Creek	8,000
Frank L. Harmon	July 19	Canyon Creek	8,000
W. N. West	July 19	American River	8,000
W. J. McCleary	July 19	Shirttail Canyon	10,000
M. L. West	July 19	Yuba River	6,000
J. B. Knapp	July 19	North Fork of American River	10,000
D. M. Ray and G. H. Smith	Sept. 8	North Fork of Middle Fork of North Fork of American River	2,000
D. M. Ray and G. H. Smith	Sept. 8	Grouse Canyon	2,000
Lake Tahoe R. & T. Co.	Sept. 14	Barker Creek	3,000
Lake Tahoe R. & T. Co.	Sept. 14	Watson Lake	7,000
Lake Tahoe R. & T. Co.	Sept. 14	Bear Pen Creek	2,000
Tahoe Vista I. Co.	Sept. 14	Griff Creek	8,000
Scott Bros.	Sept. 14	Silver Creek	2,000
Scott Bros.	Sept. 14	Squaw Creek	10,000
F. R. Kohl	Sept. 19	Blackwood Creek	8,000
W. J. McCleary	Nov. 16	North Fork of American River	24,000
		Total	144,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
H. M. Freeman	July 19	South Yuba River	10,000
Frank L. Harmon	July 19	Canyon Creek	8,000
W. N. West	July 19	American River	8,000
W. J. McCleary	July 19	American River	6,000
M. L. West	July 19	Yuba River	4,000
D. M. Ray and G. H. Smith	Sept. 8	North Fork of Middle Fork of North Fork of American River	2,000
D. M. Ray and G. H. Smith	Sept. 8	Grouse Creek	2,000
Lake Tahoe R. & T. Co.	Sept. 14	Truckee River	12,000
		Total	52,000

PLUMAS COUNTY.

Distribution of Loch Leven Trout.

Applicant	Date	Water stocked	Number
J. W. Middleton	Aug. 7	Grizzly Creek	10,000
J. W. Middleton	Aug. 7	Feather River	10,000
Quincy Chamber of Com.	Aug. 7	Thompson Creek	10,000
Quincy Chamber of Com.	Aug. 7	Mill Creek	6,000
H. P. Porter	Aug. 7	Mill Creek	7,500
H. P. Porter	Aug. 7	Reyes Creek	3,000
H. P. Porter	Aug. 7	Hot Spring Gulch	1,500
H. P. Porter	Aug. 7	Soda Creek	1,500
H. P. Porter	Aug. 7	East Branch	4,500
Chas. Jones	Aug. 13	Gray Eagle Creek	5,000
Chas. Jones	Aug. 13	Frazier Creek	7,000
J. A. Donnerwirth	Aug. 13	Light Creek	20,000
B. F. Darby	Aug. 13	Bucks Creek	4,000
B. F. Darby	Aug. 13	Haskins Creek	2,000
B. F. Darby	Aug. 13	Three Lakes	4,000
W. H. Day	Aug. 20	Rock Creek	2,000
W. H. Day	Aug. 20	Jackass Creek	4,000
W. H. Day	Aug. 20	Chambers Creek	4,000
Roger T. Remick	Aug. 20	Big Bonta Creek	7,000
Roger T. Remick	Aug. 20	Little Bonta Creek	3,000
Chas. Belden	Nov. 16	Yellow Creek	8,000
Chas. Belden	Nov. 16	Chipps Creek	2,000
		Total	126,000

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
Quincy Chamber of Com.	Aug. 7	Greenhorn Creek	10,000
B. F. Pauly and E. P. Vandercook	Aug. 7	Willow Creek	5,000
B. F. Pauly and E. P. Vandercook	Aug. 7	Feather River	2,500
B. F. Pauly and E. P. Vandercook	Aug. 7	Nelson Creek	2,500
W. G. Hoffman	Aug. 7	Clear Creek	8,000
Chas. Jones	Aug. 13	Gray Eagle Creek	5,000
Chas. Jones	Aug. 13	Frazier Creek	5,000
D. N. Rogers	Aug. 13	Big Creek and branches	2,500
D. N. Rogers	Aug. 13	Clear Creek and branches	2,500
D. N. Rogers	Aug. 13	Bear Creek and branches	5,000
J. A. Donnerwirth	Aug. 13	Cooks Creek	14,000
Roger T. Remick	Aug. 20	Big Bonta Creek	7,000
Roger T. Remick	Aug. 20	Little Bonta Creek	3,000
		Total	72,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

Distribution of Black Spotted Trout.

Applicant	Date	Water stocked	Number
J. W. Middleton	Aug. 7	Willow Creek	12,000
J. W. Middleton	Aug. 7	Humbug Creek	12,000
Quincy Chamber of Com.	Aug. 7	Rock Creek	6,000
Quincy Chamber of Com.	Aug. 7	Spanish Creek	24,000
B. T. Pauly and E. P. Vandercook	Aug. 7	Willow Creek	5,000
B. T. Pauly and E. P. Vandercook	Aug. 7	Feather River	5,000
B. T. Pauly and E. P. Vandercook	Aug. 7	Nelson Creek	5,000
D. N. Rogers	Aug. 13	Schnieder Creek	5,000
D. N. Rogers	Aug. 13	Big Creek and branches	12,500
D. N. Rogers	Aug. 13	Clear Creek and branches	5,000
D. N. Rogers	Aug. 13	Bear Creek and branches	7,500
S. A. Pezzola	Aug. 13	Jamison Creek	9,000
S. A. Pezzola	Aug. 13	Eureka Creek	21,000
J. A. Donnerwirth	Aug. 13	Indian Creek	24,000
B. F. Darby	Aug. 13	Haskins Creek	3,000
B. F. Darby	Aug. 13	Mill Creek	6,000
B. F. Darby	Aug. 13	Buck Creek	6,000
W. H. Day	Aug. 20	Rock Creek	5,000
W. H. Day	Aug. 20	Buck Creek	10,000
Roger T. Remick	Aug. 20	Big Bonta Creek	15,000
Roger T. Remick	Aug. 20	Little Bonta Creek	9,000
		Total	207,000

Distribution of Eastern Brook Trout.

J. W. Middleton	Aug. 7	Grizzly Creek	12,000
J. W. Middleton	Aug. 7	Willow Creek	10,000
J. W. Middleton	Aug. 7	Feather River	14,000
J. C. Donnelly	Aug. 7	Grizzly Creek	8,000
W. C. Hoffman	Aug. 7	Kellogg Creek	2,000
W. C. Hoffman	Aug. 7	Mill Creek	8,000
D. N. Rogers	Aug. 13	Three Lakes	5,000
D. N. Rogers	Aug. 13	Meadow Valley Creek	5,000
S. A. Pezzola	Aug. 13	Jamison Creek	4,000
S. A. Pezzola	Aug. 13	Eureka Lake	16,000
D. N. Rogers	Aug. 13	Greenhorn Creek	8,000
D. N. Rogers	Aug. 13	Spring Garden Creek	4,000
S. A. Pezzola	Aug. 13	Indian Creek	8,000
B. F. Darby	Aug. 13	Chipps Creek	2,000
		Total	106,000

RIVERSIDE COUNTY.

Distribution of Loch Leven Trout.

Ed Holderness	Oct. 18	Fullers Mill Canyon	4,000

Distribution of Eastern Brook Trout.

Ed Holderness	Oct. 18	Dark Canyon	4,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
B. H. Handy and H. T. Grout	Oct. 18	Spring Brook	4,000
Frank S. Johnson	Nov. 5	Coldwater Creek	4,000
John Shaver	Nov. 5	North Fork	6,000
John Shaver	Nov. 5	Strawberry Creek	2,000
John Shaver	Nov. 5	Indian Creek	4,000
		Total	20,000

SACRAMENTO COUNTY.

Distribution of Quinnat Salmon.

Fish and Game Com.	April 27	Sacramento River	335,000

SAN BERNARDINO COUNTY.

Distribution of Eastern Brook Trout.

W. J. Sanborn	Oct. 18	Ice House Creek	4,000
W. J. Sanborn	Oct. 18	Upper San Antonio	8,000
W. L. White	Oct. 18	Noble Creek	2,000
Frank Culver	Nov. 5	Mill Creek, lower	2,000
Frank Culver	Nov. 5	Mill Creek, upper	4,000
Frank Culver	Nov. 5	Mill Creek, second tributary	2,000
Jas. A. Vale	Oct. 30	Lytle Creek	12,000
Jas. A. Vale	Oct. 30	Plunge Creek	4,000
Jas. A. Vale	Oct. 30	South Fork	8,000
		Total	46,000

Distribution of Loch Leven Trout.

W. J. Sanborn	Oct. 18	San Antonio	4,000
W. L. White	Oct. 18	Noble Creek	2,000
Frank Culver	Nov. 5	Falls Creek	2,000
Frank Culver	Nov. 5	Mill Creek, first tributary	4,000
Jas. A. Vale	Oct. 30	Devil Canyon	8,000
Jas. A. Vale	Oct. 30	Waterman Canyon	8,000
Jas. A. Vale	Oct. 30	Cold Creek	8,000
Jas. A. Vale	Oct. 30	Huston Creek	4,000
Jas. A. Vale	Oct. 30	Seeley Creek	6,000
Jas. A. Vale	Oct. 30	Deep Creek	14,000
Jas. A. Vale	Oct. 30	City Creek	8,000
Jas. A. Vale	Oct. 30	Santa Ana River	8,000
		Total	76,000

Distribution of Rainbow Trout.

W. J. Sanborn	Oct. 18	San Antonio	14,000

Distribution of Black Spotted Trout.

Jas. A. Vale	Oct. 18	Big Bear Lake	138,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

Distribution of Large Lake Trout.

Applicant	Date	Water stocked	Number
Jas. A. Vale	Oct. 18	Big Bear Lake	12,000

SAN LUIS OBISPO COUNTY.

Distribution of Steelhead Trout.

San Luis Gun and Rod Club	June 27	See Canyon	12,000
San Luis Gun and Rod Club	June 27	North San Luis	12,000
San Luis Gun and Rod Club	June 27	East San Luis	9,000
San Luis Gun and Rod Club	June 27	West San Luis	6,000
San Luis Gun and Rod Club	June 27	Corral de Piedra	9,000
San Luis Gun and Rod Club	June 27	Steinner Creek	12,000
San Luis Gun and Rod Club	June 27	Islay Creek	12,000
San Luis Gun and Rod Club	June 27	Upper Choro	9,000
San Luis Gun and Rod Club	June 27	Middle Choro	12,000
San Luis Gun and Rod Club	June 27	Lower Choro	9,000
San Luis Gun and Rod Club	June 27	Mono Creek	6,000
San Luis Gun and Rod Club	June 27	Cambria Creek	6,000
San Luis Gun and Rod Club	June 27	Copper Mine Creek	6,000
San Luis Gun and Rod Club	June 27	Tono Creek	6,000
San Luis Gun and Rod Club	June 27	Old Creek	9,000
San Luis Gun and Rod Club	June 27	Prefermo Creek	3,000
San Luis Gun and Rod Club	June 27	Andrews Camp	3,000
San Luis Gun and Rod Club	June 27	Clark Valley	9,000
Dr. C. S. Noble	June 27	Arroyo Grande	30,000
Dr. C. S. Noble	June 27	Lopez Creek	21,000
		Total	201,000

SAN MATEO COUNTY.

Distribution of Steelhead Trout.

Ocean Shore Railroad	June 21	Tobin Creek	30,000
Ocean Shore Railroad	June 21	Dennison Creek	18,000
Ocean Shore Railroad	June 21	Frenchman Creek	18,000
Ocean Shore Railroad	June 21	Lobitos Creek	30,000
Ocean Shore Railroad	June 21	Tunitas Creek	30,000
Ocean Shore Railroad	June 21	Corte Madera	60,000
Ocean Shore Railroad	June 21	San Gregoria	3,000
J. B. Fleming	June 21	San Pedro Creek	30,000
Arthur E. Newman	June 21	Corte Madera	18,000
Arthur E. Newman	June 21	Bear Gulch	27,000
J. M. Huddart	Oct. 28	West Union Creek	7,500
J. M. Huddart	Oct. 28	Squealer Creek	1,250
J. M. Huddart	Oct. 28	Pond Creek	1,250
		Total	274,000

Distribution of Eastern Brook Trout.

Ocean Shore Railroad	June 21	Purisima Creek	4,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
Cleveland Forbes	June 20	West Branch El Corte Madera	4,000
Ocean Shore Railroad	June 21	Purisima Creek	16,000
		Total	20,000

SANTA BARBARA COUNTY.

Distribution of Sunfish.

H. J. Abels	July 14	Lompoc city reservoir	14

Distribution of Quinnat Salmon.

H. J. Abels	July 14	Santa Ynez River	24,000

Distribution of Steelhead Trout.

H. J. Abels	July 14	Alamar Creek	3,000
H. J. Abels	July 14	Santa Ynez River	21,000
H. J. Abels	July 14	Sisquoc	9,000
H. J. Abels	July 14	Manzana	3,000
H. J. Abels	July 14	Alamo Creek	6,000
H. J. Abels	July 14	Tepusquet Creek	12,000
H. J. Abels	July 14	Zaca Creek	6,000
H. J. Abels	July 14	Naples Creek	6,000
H. J. Abels	July 14	San Jose Creek	6,000
H. J. Abels	July 14	Guadalupe Creek	3,000
		Total	75,000

Distribution of Loch Leven Trout.

H. J. Abels	July 14	Manzana	6,000
H. J. Abels	July 14	Ballard Creek	2,000
H. J. Abels	July 14	Fir Creek	2,000
H. J. Abels	July 14	Cachuma Creek	2,000
		Total	12,000

Distribution of Eastern Brook Trout.

H. J. Abels	July 14	Sisquoc	6,000
H. J. Abels	July 14	Alamo Creek	2,000
H. J. Abels	July 14	Lion Creek	2,000
		Total	10,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

SANTA CLARA COUNTY.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
Earle Downing	June 9	Bear Creek	6,000
Earle Downing	June 9	Valpe Creek	5,000
I. L. Koppel	June 16	Coyote Creek	12,000
I. L. Koppel	June 16	Packwood Creek	9,000
I. L. Koppel	June 16	Los Animos	9,000
I. L. Koppel	June 16	Laurel Creek	6,000
I. L. Koppel	June 16	Packwood Creek	3,000
I. L. Koppel	June 16	Coyote Creek	9,000
I. L. Koppel	June 16	Little Arthur Creek	9,000
I. L. Koppel	June 16	Bodfish Creek	9,000
I. L. Koppel	June 16	Los Animos	6,000
I. L. Koppel	June 16	Valpe Creek	6,000
I. L. Koppel	June 16	Alameda Creek	3,000
I. L. Koppel	June 16	Sweijert Creek	3,000
I. L. Koppel	June 16	Silver Creek	3,000
I. L. Koppel	June 16	Penetentia Creek	9,000
I. L. Koppel	June 16	Guadalupe Creek	18,000
I. L. Koppel	June 16	Almaden Creek	12,000
I. L. Koppel	June 16	Trout Creek	9,000
I. L. Koppel	June 16	Campbell Creek	9,000
I. L. Koppel	June 16	Hooker Creek	3,000
I. L. Koppel	June 16	Gladas Creek	3,000
I. L. Koppel	June 26	Stevens Creek	15,000
I. L. Koppel	June 26	Lyndon Creek	5,000
I. L. Koppel	June 26	Cavanaugh Creek	5,000
I. L. Koppel	June 26	Hooper Creek	5,000
I. L. Koppel	June 26	Austrian Creek	2,500
I. L. Koppel	June 26	Los Gatos Creek	5,000
F. Marriott	June 26	Los Uvas Creek	24,000
E. L. Caldren	Oct. 28	Los Gatos Creek	15,000
		Total	237,500

Distribution of Eastern Brook Trout.

L. F. Cox	June 26	Booker Creek	2,000
L. F. Cox	June 26	Lake Ranch Creek	2,000
L. F. Cox	June 26	Van Ness Creek	4,000
		Total	8,000

SANTA CRUZ COUNTY.

Distribution of Blue Gill Sunfish.

Supervisors Santa Cruz County	Aug. 25	Lagoon near Watsonville	15

Distribution of Perch.

Supervisors Santa Cruz County	Aug. 25	Lagoon near Watsonville	15

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
Watsonville Fish and Game Protective Assn.	Oct. 29	Corralitos Creek	9,000
Watsonville Fish and Game Protective Assn.	Oct. 29	Shingle Mill Creek	15,000
Watsonville Fish and Game Protective Assn.	Oct. 29	Diablo Creek	6,000
		Total	30,000

SHASTA COUNTY.

Distribution of Black Spotted Trout.

Dunsmuir Promotion Club	Sept. 6	Little Castle Creek	60,000
Dunsmuir Promotion Club	Sept. 6	Bear Creek	60,000
Dunsmuir Promotion Club	Sept. 6	Hedge Creek	60,000
Dunsmuir Promotion Club	Sept. 6	Soda Creek	60,000
Harmon Bell	Sept. 24	Sacramento River	30,000
		Total	270,000

Distribution of Loch Leven Trout.

W. H. Logan	June 26	Duncon Creek	4,000
W. H. Logan	June 26	Eagle Creek	2,000
C. L. Watson	June 8	Clear Creek	6,000
C. L. Watson	June 8	Five Mile Gulch	2,000
C. L. Watson	June 8	French Gulch Creek	2,000
Kennett Athletic Club	June 28	Big Back Bone Creek	15,000
F. E. Elfendahl	June 28	Slave Creek	8,000
Dunsmuir Promotion Club	Sept. 6	Hedge Creek	10,000
Dunsmuir Promotion Club	Sept. 6	Soda Creek	10,000
Harmon Bell	Sept. 24	Sacramento River	10,000
Sacramento Valley and Eastern Railroad	Oct. 3	Dedalles Creek	10,000
Hazel Gold Mining Co.	Oct. 17	Crystal Creek	8,000
Hazel Gold Mining Co.	Oct. 17	Five Mile Gulch	4,000
Hazel Gold Mining Co.	Oct. 17	Klines Gulch	4,000
		Total	95,000

Distribution of Eastern Brook Trout.

C. L. Watson	June 8	Clear Creek	4,000
C. L. Watson	June 8	Klines Gulch	2,000
		Total	6,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
W. H. Logan	June 26	Duncon Creek	2,000
W. H. Logan	June 26	Eagle Creek	4,000
Kennett Athletic Club	June 28	Big Back Bone Creek	6,000
E. Elfendahl	June 28	Slave Creek	8,000
Dunsmuir Promotion Club	Sept. 6	Little Castle Creek	10,000
Dunsmuir Promotion Club	Sept. 6	Bear Creek	10,000
Seymour S. Bass	Sept. 18	McCloud River	16,000
Sacramento Valley and Eastern Railroad	Oct. 3	Dedalles Creek	10,000
		Total	66,000

SIERRA COUNTY.

Distribution of Rainbow Trout.

W. C. Murdock	Sept. 8	French Creek	5,000
W. C. Murdock	Sept. 8	Little Truckee River	5,000
W. C. Murdock	Sept. 8	Lacy Valley Creek	10,000
		Total	20,000

Distribution of Eastern Brook Trout.

A. S. Nichols	July 19	Sierra Mills Creek	2,000
A. S. Nichols	July 19	Randolph Creek	2,000
G. F. Edwards	Aug. 7	Gold Lake	6,000
G. V. Redmayne	Aug. 13	Gold Lake	10,000
R. W. Thorne	Aug. 20	Badnock Creek	4,000
R. W. Thorne	Aug. 20	Smith Creek	4,000
R. W. Thorne	Aug. 20	Turner Creek	4,000
		Total	32,000

Distribution of Loch Leven Trout.

A. S. Nichols	July 19	Sierra Mills Creek	6,000
A. S. Nichols	July 19	Randolph Creek	2,000
A. S. Nichols	July 19	Strong Creek	4,000
G. F. Edwards	Aug. 7	Gold Lake	6,000
		Total	18,000

Distribution of Black Spotted Trout.

G. V. Redmayne	Aug. 13	Gold Lake	27,000
R. W. Thorne	Aug. 20	Badnock Creek	6,000
R. W. Thorne	Aug. 20	Smith Creek	6,000
R. W. Thorne	Aug. 20	Turner Creek	6,000
		Total	45,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

SISKIYOU COUNTY.

Distribution of Catfish.

Applicant	Date	Water stocked	Number
W. J. Evans	Sept. 5	Meiss Lake	30
A. Caswell	Sept. 15	Dry Lake	50
		Total	80

Distribution of Black Spotted Trout.

Applicant	Date	Water stocked	Number
B. Casalta	July 11	Wagon Creek	15,000
H. A. Caldwell and Wm. Falkner	Aug. 18	Beaughan Creek	6,000
H. A. Caldwell and Wm. Falkner	Aug. 18	Eddy Lake	6,000
H. A. Caldwell and Wm. Falkner	Aug. 18	Big Springs	6,000
Montague Gun Club	Aug. 19	Little Shasta	15,000
J. F. Kuck	Aug. 21	Box Canyon	36,000
J. F. Kuck	Aug. 21	Sullaway Creek	30,000
J. F. Kuck	Aug. 21	Spring Creek	16,000
J. F. Kuck	Aug. 21	Keysers Meadows	18,000
McCloud River R. R. Co.	Aug. 25	McCloud River	15,000
McCloud River R. R. Co.	Aug. 26	McCloud River	21,000
McCloud River R. R. Co.	Aug. 27	McCloud River	15,000
McCloud River R. R. Co.	Aug. 28	McCloud River	9,000
Dr. W. B. Mason	Oct. 16	Castle Creek	6,000
Sisson Tavern Co.	Nov. 2	Cold Creek	56,000
		Total	270,000

Distribution of Loch Leven Trout.

Applicant	Date	Water stocked	Number
B. Casalta	July 11	Wagon Creek	8,000
Zick Abrams	Aug. 17	Abrams Lake	33,000
J. A. McCarton	Aug. 18	Shasta River	4,000
J. A. McCarton	Aug. 18	Beaughan Creek	4,000
H. A. Caldwell and W. Falkner	Aug. 18	Carrick Creek	2,000
H. A. Caldwell and W. Falkner	Aug. 18	Parks Creek	2,000
Montague Gun Club	Aug. 19	Little Shasta	10,000
J. F. Kuck	Aug. 21	Box Canyon	16,000
J. F. Kuck	Aug. 21	Sullaway Creek	10,000
J. F. Kuck	Aug. 21	Keysers Meadows	4,000
John W. Benton	Aug. 25	Butte Creek	8,000
O. E. Pile	Aug. 25	Butte Creek	8,000
McCloud River R. R. Co.	Aug. 25	McCloud River	14,000
McCloud River R. R. Co.	Aug. 26	McCloud River	18,000
McCloud River R. R. Co.	Aug. 27	McCloud River	10,000
McCloud River R. R. Co.	Aug. 28	McCloud River	8,000
F. O. Branstetter	Aug. 29	Sacramento River	16,000
Dr. W. B. Mason	Oct. 16	Castle Creek	4,000
Sisson Tavern Co.	Nov. 2	Cold Creek	45,000
		Total	224,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

SISKIYOU COUNTY.

Distribution of Eastern Brook Trout.

Applicant	Date	Water stocked	Number
B. Casalta	July 11	Wagon Creek	8,000
J. M. Estill	July 19	McCloud River	12,000
C. S. Erickson	July 19	Bear Creek	10,000
Zick Abrams	Aug. 17	Abrams Lake	7,000
J. F. Kuck	Aug. 21	Keysers Meadows	10,000
John W. Benton	Aug. 25	Butte Creek	4,000
O. E. Pile	Aug. 25	Butte Creek	6,000
McCloud River R. R. Co.	Aug. 25	McCloud River	10,000
McCloud River R. R. Co.	Aug 23	McCloud River	10,000
McCloud River R. R. Co.	Aug. 27	McCloud River	8,000
McCloud River R. R. Co.	Aug. 28	Bear Creek	12,000
		Total	97,000

Distribution of Rainbow Trout.

J. A. McCarton	Aug. 18	Parks Creek	4,000
W. J. Bray	Aug. 21	Antelope Creek	20,000
J. F. Kuck	Aug. 21	Spring Creek	4,000
McCloud River R. R. Co.	Aug. 25	McCloud River	6,000
McCloud River R. R. Co.	Aug. 26	McCloud River	8,000
McCloud River R. R. Co.	Aug. 27	McCloud River	10,000
Sisson Tavern Co.	Nov. 2	Cold Creek	30,000
		Total	82,000

Distribution of Silver Salmon.

Fish and Game Com.	Aug. 5	Klamath River	12,500

Distribution of Quinnat Salmon.

Fish and Game Com.	Mar. 2	Cold Creek, tributary to Sacramento River	1,500,000
Fish and Game Com.	Mar. 15	Cold Creek, tributary to Sacramento River	750,000
Fish and Game Com.	April 1	Sullaway Creek, tributary to Sacramento River	1,150,000
Fish and Game Com.	April 1	Cold Creek, tributary to Sacramento River	350,000
Fish and Game Com.	April 2	Cold Creek, tributary to Sacramento River	550,000
Fish and Game Com.	April 2	Sullaway Creek, tributary to Sacramento River	800,000
Fish and Game Com.	April 3	Cold Creek, tributary to Sacramento River	150,000
Fish and Game Com.	April 4	Cold Creek, tributary to Sacramento River	2,450,000
Fish and Game Com.	April 4	Sullaway Creek, tributary to Sacramento River	350,000
Fish and Game Com.	April 5	Klamath River	330,000
Fish and Game Com.	April 7	Klamath River	350,000
Fish and Game Com.	April 16	Sullaway Creek, tributary to Sacramento River	400,000
Fish and Game Com.	April 16	Klamath River	335,000
Fish and Game Com.	April 18	Klamath River	335,000
Fish and Game Com.	April 19	Cold Creek, tributary to Sacramento River	277,500
Fish and Game Com.	April 28	Cold Creek, tributary to Sacramento River	2,700,000
Fish and Game Com.	April 29	Cold Creek, tributary to Sacramento River	300,000
Fish and Game Com.	April 30	Cold Creek, tributary to Sacramento River	383,000
Fish and Game Com.	May 5	Spring Creek, tributary to Sacramento River	200,000
Fish and Game Com.	May 6	Spring Creek, tributary to Sacramento River	400,000
Fish and Game Com.	May 7	Sullaway Creek, tributary to Sacramento River	200,000
Fish and Game Com.	May 22	Cold Creek, tributary to Sacramento River	139,115
Fish and Game Com.	May 25	Cold Creek, tributary to Sacramento River	800,000
Fish and Game Com.	Sept. 28	Cold Creek, tributary to Sacramento River	2,100,000
Fish and Game Com.	Oct. 6	Spring Creek, tributary to Sacramento River	1,900,000
		Total	19,199,615

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

SOLANO COUNTY.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
Winters Fish and Game Protective Assn.	July 29	Miller Canyon	15,000

Distribution of Quinnat Salmon.

Fish and Game Com.	April 2	Straits of Carquinez	350,000
Fish and Game Com.	April 18	Straits of Carquinez	335,000
Fish and Game Com.	April 19	Straits of Carquinez	315,000
Fish and Game Com.	April 24	Straits of Carquinez	330,000
Fish and Game Com.	May 4	Straits of Carquinez	330,000
		Total	1,660,000

SONOMA COUNTY.

Distribution of Steelhead Trout.

California Anglers' Assn.	July 29	Sonoma Creek	15,000
California Anglers' Assn.	July 29	Stewart Creek	10,000
California Anglers' Assn.	July 29	Graham Creek	12,500
California Anglers' Assn.	July 29	Ahlers Creek	7,500
W. R. Stearns	July 29	Sonoma Creek	20,000
California Anglers' Assn.	Aug. 2	West Austin Creek	25,000
California Anglers' Assn.	Aug. 2	Ward Creek	12,500
California Anglers' Assn.	Aug. 2	Bear Pen Creek	12,500
A. H. Richardson	Aug. 2	Stewarts Point Creek	10,000
		Total	125,000

TEHAMA COUNTY.

Distribution of Loch Leven Trout.

F. G. Powell	July 28	Antelope Creek	8,000
G. W. Vestal	Aug. 1	Mill Creek	6,000
N. I. Boone	Aug. 1	Paynes Creek	4,000
Louis Winter	Sept. 8	Battle Creek	6,000
H. H. Zimmerman	Sept. 24	Mill Creek	4,000
Paul Stoll	Sept. 24	Elder Creek	6,000
J. A. Owens	Oct. 17	South Cottonwood	4,000
		Total	38,000

Distribution of Eastern Brook Trout.

C. W. DeLong	July 19	Mill Creek	4,000
J. H. Bradley	Aug. 19	South Fork Cottonwood Creek	8,000
H. H. Zimmerman	Sept. 24	Mill Creek	4,000
J. A. Owens	Oct. 17	South Cottonwood	6,000
		Total	22,000

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
C. W. DeLong	July 19	Mill Creek	6,000
E. G. Powell	July 28	Antelope Creek	6,000
G. W. Vestal	Aug. 1	Mill Creek	4,000
N. I. Boone	Aug. 1	Paynes Creek	4,000
Louis Winter	Sept. 8	Battle Creek	8,000
Paul Stoll	Sept. 21	Elder Creek	4,000
		Total	32,000

TULARE COUNTY.

Distribution of Black Spotted Trout.

Porterville Fish and Game Protective Assn.	Oct. 9	Kessing Creek	4,000
Porterville Fish and Game Protective Assn.	Oct. 9	North Fork South Tule	8,000
Tule River Shooting and Fishing Club	Oct. 9	Tule River	12,000
Tule River Shooting and Fishing Club	Oct. 9	Boulder Creek	3,000
Tule River Shooting and Fishing Club	Oct. 9	Cory Creek	3,000
Doyle Spring Club	Oct. 9	North Fork Middle Tule	9,000
Doyle Spring Club	Oct. 9	Alder Creek	6,000
H. M. Berry	Oct. 9	Poso Creek	12,000
Ed Cramer	Oct. 9	White River	12,000
		Total	69,000

Distribution of Loch Leven Trout.

Wirsh & Oldfield	Aug. 31	Kern River	30,000
Deer Creek Fish and Game Assn.	Oct. 9	South Deer Creek	10,000
Porterville Fish and Game Protective Assn.	Oct. 9	Kessing Creek	2,000
Porterville Fish and Game Protective Assn.	Oct. 9	North Fork South Tule	4,000
Tule River Shooting and Fishing Club	Oct. 9	Tule River	8,000
Tule River Shooting and Fishing Club	Oct. 9	Boulder Creek	4,000
Tule River Shooting and Fishing Club	Oct. 9	Cory Creek	4,000
Doyle Spring Club	Oct. 9	North Fork Middle Tule	4,000
Doyle Spring Club	Oct. 9	Alder Creek	4,000
H. M. Berry	Oct. 9	Poso Creek	6,000
Ed Cramer	Oct. 9	White River	6,000
		Total	82,000

Distribution of Eastern Brook Trout.

Wirsh & Oldfield	Aug. 31	Kern River	10,000
Deer Creek Fish and Game Assn.	Oct. 9	North Deer Creek	8,000
Doyle Spring Club	Oct. 9	North Fork Middle Tule	3,000
Doyle Spring Club	Oct. 9	Alder Creek	3,000
		Total	21,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
Wirsh & Oldfield	Aug. 31	Kern River	10,000
Deer Creek Fish and Game Assn.	Oct. 9	South Deer Creek	2,000
Deer Creek Fish and Game Assn.	Oct. 9	North Deer Creek	4,000
		Total	16,000

TUOLUMNE COUNTY.

Distribution of Black Spotted Trout.

Board of Supervisors, Tuolumne County	Aug. 26	Main Stanislaus River	42,000
Board of Supervisors, Tuolumne County	Aug. 26	South Stanislaus River at Strawberry	15,000
Board of Supervisors, Tuolumne County	Aug. 26	North Tuolumne River at Empire Mills	6,000
Board of Supervisors, Tuolumne County	Aug. 26	Sullivans Creek	9,000
		Total	72,000

Distribution of Loch Leven Trout.

Board of Supervisors, Tuolumne County	Aug. 26	Main Stanislaus River	26,000
Board of Supervisors, Tuolumne County	Aug. 26	South Stanislaus River at Strawberry	24,000
Board of Supervisors, Tuolumne County	Aug. 26	North Tuolumne River at Empire Mills	4,000
Board of Supervisors, Tuolumne County	Aug. 26	Five Mile Creek	8,000
Sam E. Redmond	Nov. 12	North Fork of Stanislaus River	2,000
Lewis H. Elliott	Nov. 12	Main Stanislaus River	9,000
Sierra and San Francisco Power Co.	Nov. 12	Indian Creek	2,000
Sierra and San Francisco Power Co.	Nov. 12	Reservoir, Power House	6,000
		Total	81,000

Distribution of Rainbow Trout.

Board of Supervisors, Tuolumne County	Aug. 26	Main Stanislaus River	8,000
Board of Supervisors, Tuolumne County	Aug. 26	South Stanislaus River at Strawberry	10,000
Board of Supervisors, Tuolumne County	Aug. 26	North Tuolumne River at Empire Mills	8,000
Board of Supervisors, Tuolumne County	Aug. 26	Tuolumne Creek	4,000
A. W. Stewart	Aug. 26	Cow Creek	4,000
Sam E. Redmond	Nov. 12	North Fork Stanislaus River	2,000
		Total	36,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

Distribution of Eastern Brook Trout.

Applicant	Date	Water stocked	Number
Board of Supervisors, Tuolumne County	Aug. 26	Main Stanislaus River	16,000
Board of Supervisors, Tuolumne County	Aug. 26	South Stanislaus River at Strawberry	4,000
Board of Supervisors, Tuolumne County	Aug. 26	Sullivans Creek	6,000
Board of Supervisors, Tuolumne County	Aug. 26	Shaws Flat Creek	4,000
Board of Supervisors, Tuolumne County	Aug. 26	Tuolumne Creek	4,000
Board of Supervisors, Tuolumne County	Aug. 26	Five Mile Creek	8,000
Board of Supervisors, Tuolumne County	Aug. 26	Clark Stream	10,000
A. W. Stewart	Aug. 26	Cow Creek	4,000
Lewis H. Elliott	Nov. 12	Main Stanislaus River	9,000
Sierra and San Francisco Power Co.	Nov. 12	Indian Creek	2,000
Sierra and San Francisco Power Co.	Nov. 12	Clarks Fork	4,000
Sierra and San Francisco Power Co.	Nov. 12	Middle Fork Stanislaus River	2,000
		Total	73,000

VENTURA COUNTY.

Distribution of Quinnat Salmon.

J. J. Barnett	July 14	Ventura River	10,000
J. J. Barnett	July 14	San Antonio Creek	8,000
J. J. Barnett	July 14	Coyote Creek	6,000
		Total	24,000

Distribution of Steelhead Trout.

R. L. Poplin	July 14	Santa Paula Creek	12,000
J. J. Barnett	July 14	Ventura River	52,000
J. J. Barnett	July 14	San Antonio Creek	8,000
J. J. Barnett	July 14	North Fork Creek	15,000
J. J. Barnett	July 14	Conejo Creek	16,000
S. M. Mosher	Oct. 29	Sespee Creek	33,000
G. C. Hollister	Oct. 29	Agua Blanca	18,000
A. M. Meyer	Oct. 29	Borchard Creek	8,000
A. M. Meyer	Oct. 29	Sycamore Creek	3,000
		Total	165,000

YOLO COUNTY.

Distribution of Black Bass.

M. H. Stitt	Aug. 28	Cache Creek	50

YUBA COUNTY.

Distribution of Black Bass.

Applicant	Date	Water stocked	Number
Dr. L. L. Kimerer	Nov. 16	Middle Dry Creek	32
Dr. L. L. Kimerer	Nov. 16	Lower Dry Creek	37
		Total	69

TAHOE HATCHERY.

Fish Distribution by Counties. Season 1914.

EL DORADO COUNTY.

Distribution of Black Spotted Trout.

Carl Fluegge	June 23	Green Bay, Fallen Leaf Lake	60,000
Tait and Mann	June 28	Taylor Creek	60,000
Carl Fluegge	June 25	Green Bay, Fallen Leaf Lake	60,000
Carl Fluegge	June 27	Taylor Creek	30,000
Carl Fluegge	June 27	Power House Ditch	30,000
J. C. Copeland	June 28	Eagle Lake	30,000
J. C. Copeland	June 28	Power House Ditch	15,000
Carl Fluegge	June 29	Green Bay, Fallen Leaf Lake	40,000
Carl Fluegge	June 29	Power House Ditch	15,000
Tait and Mann	June 30	Taylor Creek	40,000
Tait and Mann	July 2	Power House Ditch	30,000
Tait and Mann	July 2	Taylor Creek	50,000
Tait and Mann	July 2	Cascade Lake	60,000
Tait and Mann	July 5	Taylor Creek	110,000
Tait and Mann	July 5	Tallac Creek	70,000
Tait and Mann	July 6	Tallac Creek	90,000
Tait and Mann	July 6	Power House Ditch	20,000
Bert Granlees	July 6	Flourney Creek	50,000
Bert Granlees	July 7	Taylor Creek	70,000
Carl Fluegge	June 8	Green Bay, Fallen Leaf Lake	50,000
Carl Fluegge	July 8	Power House Ditch	70,000
Bert Granlees	July 8	Little Truckee River, tributary to Lake Tahoe	70,000
Tait and Mann	July 9	Tallac Creek	120,000
Tait and Mann	July 9	Taylor Creek	35,000
Tait and Mann	July 10	Power House Ditch	70,000
Tait and Mann	July 10	Taylor Creek	65,000
Glen Alpine Co.	July 20	Grass Lake	44,500
Glen Alpine Co.	July 21	Susie Lake	44,500
Glen Alpine Co.	July 22	Gilmore Lake	44,500
J. C. Copeland	July 25	Eagle Lake	30,000
A. Richardson	July 30	Little Truckee River, tributary to Lake Tahoe	40,000
Glen Alpine Co.	July 31	Half Moon Lake	44,500
Glen Alpine Co.	Aug. 1	Grass Lake	44,500
Glen Alpine Co.	Aug. 2	Heather Lake	44,500
Glen Alpine Co.	Aug. 3	Gilmore Lake	44,500
Glen Alpine Co.	Aug. 4	Susie Lake	44,500
Glen Alpine Co.	Aug. 4	Glen Alpine Creek	44,500
Tahoe Tavern Co.	Sept. 14	Meeks Creek	30,000
		Total	1,910,500

Distribution of Large Lake Trout.

Tait and Mann	July 26	Taylor Creek	15,000
Tait and Mann	July 30	Taylor Creek	8,000
A. Richardson	July 30	Little Truckee River, tributary to Lake Tahoe	37,000
A. Richardson	July 30	Power House Ditch	6,000
Tahoe Tavern Co.	Sept. 14	Meeks Bay	5,000
		Total	71,000

TAHOE HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

NEVADA COUNTY.

Distribution of Black Spotted Trout.

Truckee Chamber of Com.	Aug. 30	Donner Lake	125,000
Mrs. Geo. W. Kenney	Aug. 31	Lake Independence	50,000
H. M. Freeman	Sept. 14	Lake Sterling	40,000
		Total	215,000

Distribution of Large Lake Trout.

H. M. Freeman	Sept. 14	Lake Sterling	8,000

PLACER COUNTY.

Distribution of Large Lake Trout.

Tahoe Tavern Co.	Aug. 13	Ward Creek	6,000
Tahoe Tavern Co.	Aug. 26	Blackwood Creek	5,000
Tahoe Tavern Co.	Sept. 5	Blackwood Creek	5,000
Tahoe Tavern Co.	Sept. 15	Slim Jim Creek	6,500
		Total	21,500

Distribution of Black Spotted Trout.

Tahoe Tavern Co.	Aug. 11	Slim Jim Creek	50,000
Tahoe Tavern Co.	Aug. 13	Ward Creek	60,000
Tahoe Tavern Co.	Aug. 14	Rock Creek	55,000
F. H. Walker	Aug. 18	New Burton Creek	60,000
Tahoe Tavern Co.	Aug. 26	Blackwood Creek	50,000
Tahoe Tavern Co.	Aug. 27	Rock Creek	40,000
Tahoe Vista Imp. Co.	Sept. 3	Griffen Creek	45,000
Murphy Bros. & Morgan	Sept. 4	McKinney Creek	50,000
Tahoe Tavern Co.	Sept. 5	Blackwood Creek	40,000
Tahoe Tavern Co.	Sept. 7	General Phipps Creek	50,000
Tahoe Tavern Co.	Sept. 8	Ward Creek	60,000
Tahoe Tavern Co.	Sept. 15	Slim Jim Creek	32,000
		Total	592,000

SIERRA COUNTY.

Distribution of Black Spotted Trout.

W. C. Murdock	Aug. 26, 27, 28	Webber Lake	100,000
Mrs. Geo. Kenney	Sept. 1	Lake Independence	50,000
		Total	150,000

Distribution of Large Lake Trout.

W. C. Murdock	Aug. 26, 27, 28	Webber Lake	10,000

PRICE CREEK HATCHERY.

Fish Distribution by Counties. Season 1914.

HUMBOLDT COUNTY.

Distribution of Quinnat Salmon.

Applicant	Date	Water stocked	Number
Fish and Game Com.	Feb. 7	Price Creek	100,000
Fish and Game Com.	Feb. 9	Price Creek	155,000
Fish and Game Com.	Feb. 10	Price Creek	120,000
Fish and Game Com.	Feb. 11	Eel River	210,000
Fish and Game Com.	Feb. 13	Eel River	183,000
Fish and Game Com.	Feb. 14	Eel River	240,000
Fish and Game Com.	Feb. 15	Eel River	220,000
Fish and Game Com.	Feb. 16	Eel River	170,000
Fish and Game Com.	Feb. 18	Price Creek	280,000
Fish and Game Com.	Feb. 19	Price Creek	200,000
Fish and Game Com.	Feb. 20	Price Creek	400,000
Fish and Game Com.	Feb. 26	Price Creek	100,000
Fish and Game Com.	Mar. 6	Price Creek	42,610
Fish and Game Com.	Mar. 7	Price Creek	100,000
Fish and Game Com.	Mar. 8	Price Creek	167,850
Fish and Game Com.	Mar. 9	Price Creek	26,305
Fish and Game Com.	Mar. 10	Price Creek	27,235
Fish and Game Com.	Mar. 10	Eel River	140,000
Arcata Chamber of Com.	Mar. 27	Mad River	75,000
Harbor Commissioners	Mar. 31	Freshwater Creek, tributary to Humboldt Bay	37,500
Eureka Chamber of Com.	Mar. 31	Jacoby Creek, tributary to Humboldt Bay	37,500
Arcata Chamber of Com.	April 4	Mad River	75,000
Arcata Chamber of Com.	April 7	Mad River	75,000
Fish and Game Com.	April 10	Eel River	691,000
Eureka Chamber of Com.	April 10	Elk River, tributary to Humboldt Bay	75,000
		Total	3,948,000

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
Harbor Commission	April 29	Jacoby Creek	37,500
Harbor Commission	April 29	Freshwater Creek	37,500
Harbor Commission	April 30	Elk River	75,000
Arcata Chamber of Com.	May 5	Mad River	50,000
Fish and Game Com.	May 6	Price Creek and Eel River	206,000
		Total	406,000

UKIAH HATCHERY.

Fish Distribution by Counties. Season 1914.

MENDOCINO COUNTY.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
Fish and Game Com.	July 7	Eel River	100,000
Mendocino State Hospital	July 9	South Mill Creek	40,000
Cox & Halliday	July 11	Reeves Mill Creek	50,000
B. J. Reilly	July 20	Russian River	35,000
A. P. Weger	July 21	Big River at Orrs Springs	50,000
L. Gobbe	July 23	Cunningham Creek	20,000
W. P. Burke	July 24	Feliz Creek	50,000
Robt. Jones	July 28	Sulphur Creek	20,000
B. M. Bucknell	July 29	Robinson Creek	50,000
Clare Smith	July 30	Cold Creek	14,583
		Total	429,583

TAHOE HATCHERY—Continued.

Fish Distribution by Counties. Season 1914.

SONOMA COUNTY.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
J. M. Alexander	July 14	Warm Spring Creek	30,000
J. M. Alexander	July 14	Mill Creek	35,000
J. M. Alexander	July 14	Little Sulphur Creek	35,000
		Total	100,000

WAWONA HATCHERY.

Fish Distribution by Counties. Season 1914.

MADERA COUNTY.

Distribution of Large Lake Trout.

Fish and Game Com.	July 19	Raynor Creek	6,000

Distribution of Black Spotted Trout.

Fish and Game Com.	July 19	Big Creek	18,000
Fish and Game Com.	July 20	Big Creek	18,000
Fish and Game Com.	July 21	Raynor Creek	14,000
Fish and Game Com.	July 23	Sugar Pine Mill Creek	8,000
Fish and Game Com.	July 27	Big Tree Creek	12,000
		Total	70,000

MARIPOSA COUNTY.

Distribution of Large Lake Trout.

Fish and Game Com.	July 22	Headwaters of Meadow Creek	5,000
Fish and Game Com.	July 24	Small Bridal Veil Creek	10,000
		Total	15,000

Distribution of Black Spotted Trout.

Fish and Game Com.	July 15	Meadow Creek	18,000
Fish and Game Com.	July 16	Headwaters of Miami Creek	3,000
Fish and Game Com.	July 16	Chilnualna Creek	12,000
Fish and Game Com.	July 16	Bruce Creek	6,000
Fish and Game Com.	July 17	Stella Lake	22,000
Fish and Game Com.	July 18	Merced River	25,000
Fish and Game Com.	July 22	Headwaters of Meadow Creek	8,000
Fish and Game Com.	July 24	Small Bridal Veil Creek	6,000
Fish and Game Com.	July 25	Big Creek	9,000
Fish and Game Com.	July 25	Laurel Creek	6,000
Fish and Game Com.	July 26	Merced River	18,000
Fish and Game Com.	July 27	Brush Creek	12,000
		Total	145,000

SISSON HATCHERY.

Fish Distribution by Counties. Season 1915.

ALAMEDA COUNTY.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
Earle Downing	June 9	Apperson Creek	8,000
Earle Downing	June 9	Bachelor Canyon	8,000
Earle Downing	June 9	Arbrott Creek	8,000
Earle Downing	June 9	Indian Creek	12,000
Earle Downing	June 9	La Costa Creek, headwaters	24,000
Earle Downing	June 9	La Costa Creek, Shakers Vineyard	12,000
Earle Downing	June 9	Calaveras Creek	10,000
Earle Downing	June 9	Alameda Creek, above Calaveras Creek	20,000
Earle Downing	June 9	Mocho Creek, headwaters	12,000
Earle Downing	June 9	Mocho Creek, above Wilson Creek	8,000
Earle Downing	June 9	Trout Creek	12,000
Earle Downing	June 9	Arroyo Bayou	8,000
Earle Downing	June 9	Acker Creek, small stream tributary to Bayou	8,000
Earle Downing	June 9	Another small creek	2,000
Earle Downing	June 9	Kaiser Creek	24,000
Earle Downing	June 9	North Branch of Dry Creek	8,000
Earle Downing	June 9	San Lorenzo Creek	32,000
Earle Downing	June 9	Palomares Creek	64,000
Earle Downing	June 9	Crow Creek	40,000
Earle Downing	June 9	Bellinas Creek	12,000
Earle Downing	June 9	Goulardt Creek	4,000
Earle Downing	June 9	Ivory Creek	4,000
Earle Downing	June 9	Small stream by Brushy Peak	4,000
Earle Downing	June 9	Stony Brook	12,000
Earle Downing	June 9	Alameda Creek	8,000
Earle Downing	June 9	Arroyo Bayou, between Sunol and Pleasanton	8,000
Earle Downing	June 9	South Fork of Dry Creek	8,000
		Total	380,000

ALPINE COUNTY.

Distribution of Loch Leven Trout.

Chas. W. Tryon	Aug. 17	Highland Lakes	10,000

AMADOR COUNTY.

Distribution of Steelhead Trout.

Sutter Creek Fish Club	July 27	Sutter Creek	6,000
F. V. Rocca	July 27	Silver Lake	15,000
		Total	21,000

Distribution of Loch Leven Trout.

Women's Improvement Club of Jackson	July 27	Silver Lake	10,000
F. V. Rocca	July 27	Silver Lake	10,000
		Total	20,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Eastern Brook Trout.

Applicant	Date	Water stocked	Number
Women's Improvement Club of Jackson	July 27	Silver Lake	10,000
Sutter Creek Fish Club	July 27	Sutter Creek	10,000
		Total	20,000

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
Sutter Creek Fish Club	July 27	Sutter Creek	21,000

BUTTE COUNTY.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
A. J. Williams	Aug. 26	Clear Creek	6,000
A. J. Williams	Aug. 26	Berry Creek	6,000
Dr. P. H. Dunbar	Aug. 26	Big Kimshew and tributaries	20,000
Clay Buchanan	Aug. 26	Big Kimshew and tributaries	20,000
A. C. Musselman	Aug. 26	Little Butte Creek	7,500
A. C. Musselman	Aug. 26	Mosquito Creek	2,500
		Total	62,000

Distribution of Eastern Brook Trout.

Applicant	Date	Water stocked	Number
W. H. King	June 13	Flea Valley Creek	8,000
W. H. King	June 13	Camp Creek	2,000
W. H. King	June 13	North Fork of Feather River	2,000
J. C. Carter	June 12	Big Chico Creek	18,000
J. H. Richardson	June 12	Mud Creek	9,000
A. J. Stanley	Aug. 26	Little Butte Creek	10,000
		Total	49,000

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
W. H. King	July 21	Flea Valley Creek	5,000
W. H. King	July 21	Camp Creek	3,000
W. H. King	July 21	Mill Creek	3,000
W. H. King	July 21	Dogwood Creek	3,000
W. H. King	July 21	North Fork of Feather River	4,000
Dr. P. H. Dunbar	Aug. 26	Big Kimshew and tributaries	21,000
Clay Buchanan	Aug. 26	Big Kimshew and tributaries	20,000
A. C. Musselman	Aug. 26	Big Butte Creek	4,000
A. C. Musselman	Aug. 26	Little Butte Creek	4,000
A. C. Musselman	Aug. 26	Mosquito Creek	2,000
A. J. Stanley	Aug. 26	Little Butte Creek	4,000
A. J. Stanley	Aug. 26	West Branch of Feather River	10,000
		Total	86,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Loch Leven Trout.

Applicant	Date	Water stocked	Number
W. H. King	June 13	Flea Valley Creek	3,000
W. H. King	June 13	Camp Creek	1,000
W. H. King	June 13	North Fork of Feather River	2,000
J. C. Carter	June 12	Big Chico Creek	18,000
J. H. Richardson	June 12	Mud Creek	9,000
A. J. Williams	Aug. 26	Clear Creek	2,000
A. J. Williams	Aug. 26	Berry Creek	2,000
Clay Buchanan	Aug. 26	Big Kimshew and tributaries	10,000
A. C. Musselman	Aug. 26	Little Butte Creek	6,000
		Total	53,000

Distribution of Black Spotted Trout.

W. C. Peachy	Sept. 23	North Fork of Feather River	10,000

CALAVERAS COUNTY.

Distribution of Steelhead Trout.

Board of Supervisors of Calaveras County	July 27	North Fork of Mokelumne River	30,000
Board of Supervisors of Calaveras County	July 27	South Fork of Mokelumne River	36,000
Board of Supervisors of Calaveras County	July 27	Licking Fork of Mokelumne River	12,000
Board of Supervisors of Calaveras County	July 27	Middle Fork of Mokelumne River and tributary to Middle Fork	45,000
M. P. Avery	Sept. 9	Stanislaus River at Ramsays	6,000
M. P. Avery	Sept. 9	San Antone Creek at Hodges	4,000
S. E. Redmond	Sept. 9	Big Meadow Creek	4,000
S. E. Redmond	Sept. 9	Upper Stanislaus River	8,000
Sierra and S. F. Power Co.	Sept. 9	Clarks Flat Creek	7,000
Ben Stephens	Sept. 9	San Antone Creek	3,000
Ben Stephens	Sept. 9	O'Neals Creek	3,000
Board of Supervisors of Calaveras County	Sept. 14	San Antone Creek at Dunbar Crossing	2,000
Board of Supervisors of Calaveras County	Sept. 14	Rattlesnake Creek	4,000
Board of Supervisors of Calaveras County	Sept. 14	Stanislaus River	20,000
Board of Supervisors of Calaveras County	Sept. 14	Love Creek	8,000
Board of Supervisors of Calaveras County	Sept. 14	Moran Creek	12,000
Board of Supervisors of Calaveras County	Sept. 14	Peppermint Creek	8,000
Board of Supervisors of Calaveras County	Sept. 14	Murphy's Creek	16,000
		Total	228,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Loch Leven Trout.

Applicant	Date	Water stocked	Number
Board of Supervisors of Calaveras County	July 27	North Fork of Mokelumne River	7,500
Board of Supervisors of Calaveras County	July 27	Middle Fork of Mokelumne River and tributary to Middle Fork	12,500
Ben Stephens	Sept. 9	San Antone Creek	2,000
Ben Stephens	Sept. 9	O'Neals Creek	2,000
		Total	24,000

Distribution of Rainbow Trout.

Board of Supervisors of Calaveras County	July 27	North Fork of Mokelumne River	21,000
Board of Supervisors of Calaveras County	July 27	South Fork of Mokelumne River	24,000
Board of Supervisors of Calaveras County	July 27	Licking Fork of Mokelumne River	6,000
Board of Supervisors of Calaveras County	July 27	Middle Fork of Mokelumne River and tributary to Middle Fork	12,000
M. P. Avery	Sept. 9	Stanislaus River at Ramsays	4,000
M. P. Avery	Sept. 9	San Antone Creek at Hodges	2,000
S. E. Redmond	Sept. 9	Upper San Antone Creek	4,000
Ben Stephens	Sept. 9	San Antone Creek	2,000
Ben Stephens	Sept. 9	O'Neals Creek	2,000
Board of Supervisors of Calaveras County	Sept. 14	Sand Meadow	10,000
Board of Supervisors of Calaveras County	Sept. 14	Mill Creek	10,000
Board of Supervisors of Calaveras County	Sept. 14	Beaver Creek	10,000
		Total	107,000

COLUSA COUNTY.

Distribution of Loch Leven Trout.

B. H. Mace	July 21	Little Stony Creek	6,000
B. H. Mace	July 21	Big Stony Creek	17,000
		Total	23,000

Distribution of Eastern Brook Trout.

B. H. Mace	July 21	Mill Creek	3,000
B. H. Mace	July 21	Little Stony Creek	3,000
B. H. Mace	July 21	Big Stony Creek	9,000
		Total	15,000

Distribution of Rainbow Trout.

B. H. Mace	July 21	Mill Creek	3,000
B. H. Mace	July 21	Big Stony Creek	8,000
		Total	11,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

CONTRA COSTA COUNTY.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
Earle Downing	June 9	Morris Canyon	8,000
Earle Downing	July 21	San Ramon Valley Creek	18,000
Earle Downing	July 21	San Ramon	6,000
Earle Downing	July 21	Walnut Creek	6,000
Earle Downing	July 21	Mitchel Canyon	9,000
		Total	47,000

EL DORADO COUNTY.

Distribution of Bass.

F. G. Warner	Aug. 21	North Fork of Cosumnes River	26

Distribution of Steelhead Trout.

El Dorado County Rod and Gun Club	Aug. 15	Middle Fork of American River	85,000
George Neale	July 13	South Fork of American River at Salmon Falls	105,000
George Neale	July 13	South Fork of Amer. River at Mormon Island	66,000
George Neale	July 13	Main River at Prison, above dam	9,000
El Dorado County Rod and Gun Club	Aug. 22	South Canyon, Iowa Canyon	17,500
El Dorado County Rod and Gun Club	Aug. 22	Middle Fork of Cosumnes River	25,000
El Dorado County Rod and Gun Club	Aug. 22	North and Middle Cosumnes	12,500
El Dorado County Rod and Gun Club	Aug. 22	Steeley Fork of Cosumnes River	10,000
El Dorado County Rod and Gun Club	Aug. 22	Big Silver Creek	35,000
El Dorado County Rod and Gun Club	Aug. 21	Middle Fork of Cosumnes River and tributaries	75,000
North Fork Game Protective Association	Sept. 21	Rock Creek	4,000
North Fork Game Protective Association	Sept. 24	Otter Creek	6,000
North Fork Game Protective Association	Sept. 24	Canyon Creek	2,000
		Total	452,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Loch Leven Trout.

Applicant	Date	Water stocked	Number
El Dorado County Rod and Gun Club	Aug. 15	Middle Fork of American River	26,000
Chas. Edner	Aug. 15	Little South Fork of Cosumnes River	4,000
George Neale	July 13	Middle Fork of Cosumnes River	6,000
George Neale	July 13	Scott Creek	2,000
El Dorado County Rod and Gun Club	Aug. 22	Rock Creek	16,000
El Dorado County Rod and Gun Club	Aug. 22	Middle Fork of Cosumnes River	4,000
El Dorado County Rod and Gun Club	Aug. 29	Park Creek	6,000
North Fork Game Protective Association	Sept. 4	Rock Creek	2,000
F. J. Pomin	Sept. 16	Canyon Creek	8,000
Glen Alpine Springs	Sept. 16	Grass Lake	5,000
Glen Alpine Springs	Sept. 16	Heather Lake	5,000
Glen Alpine Springs	Sept. 16	Susie Lake	5,000
Glen Alpine Springs	Sept. 16	Half Moon Lake	5,000
Hotel Tallac	Sept. 22	Taylor Creek	2,000
Hotel Tallac	Sept. 22	Cascade Creek	2,000
N. L. Salter	Sept. 22	Eagle Lake	4,000
N. L. Salter	Sept. 22	Eagle Creek	4,000
		Total	106,000

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
El Dorado County Rod and Gun Club	Aug. 15	Middle Fork of American River	58,000
El Dorado County Rod and Gun Club	Aug. 22	Whaler and Gadis Creek	16,000
El Dorado County Rod and Gun Club	Aug. 22	Whaler and One Eye Creek	14,000
El Dorado County Rod and Gun Club	Aug. 22	North and Middle Forks of Cosumnes River	20,000
El Dorado County Rod and Gun Club	Aug. 29	Camp Creek	12,000
El Dorado County Rod and Gun Club	Aug. 29	American River	68,000
North Fork Game Protective Association	Sept. 4	Greenwood Creek	2,000
North Fork Game Protective Association	Sept. 4	Rock Creek	2,000
North Fork Game Protective Association	Sept. 4	Canyon Creek	6,000
F. J. Pomin	Sept. 16	Richardson Lake	8,000
James Bryson	Sept. 16	Headwaters of South Fork of American River	6,000
R. Colwell	Sept. 16	Rubicon River	2,000
R. Colwell	Sept. 16	Rock Bound Lake	6,000
Hotel Tallac	Sept. 22	Angora Lakes	4,000
Hotel Tallac	Sept. 22	Taylor Creek	4,000
Hotel Tallac	Sept. 22	Cascade Creek	2,000
Murphy & Morgan	Sept. 22	Duck Creek	8,000
E. S. Schmidell	Sept. 22	Rubicon River	6,000
		Total	244,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Eastern Brook Trout.

Applicant	Date	Water stocked	Number
El Dorado County Rod and Gun Club	Aug. 15	Middle Fork of American River	26,000
F. J. Pomin	Sept. 16	Richardson Lake	4,000
James Bryson	Sept. 16	Headwaters of South Fork of American River	6,000
R. Colwell	Sept. 16	Rock Bound Lake	4,000
C. P. Winchell	Sept. 22	Little Truckee River	1,500
C. P. Winchell	Sept. 22	Echo Lake	1,500
C. P. Winchell	Sept. 22	Audrain Lake	1,500
C. P. Winchell	Sept. 22	American River	3,000
C. P. Winchell	Sept. 22	Pyramid Creek	1,500
Hotel Tallac	Sept. 22	Tallac Creek	4,000
Murphy & Morgan	Sept. 22	Duck Creek	4,000
N. L. Salter	Sept. 22	Eagle Creek	1,000
N. L. Salter	Sept. 22	Eagle Lake	1,000
E. S. Schmidell	Sept. 22	Rabbit Lake	4,000
		Total	63,000

FRESNO COUNTY.

Distribution of Loch Leven Trout.

San Joaquin and Eastern Railroad	Sept. 19	Huntington Lake	100,000

Distribution of Rainbow Trout.

Shaver Lake Fishing Club	Sept. 18	Bacon Creek, tributary to Shaver Lake	20,000
San Joaquin and Eastern Railroad	Sept. 19	Stevenson Creek	6,000
San Joaquin and Eastern Railroad	Sept. 19	Huntington Lake	30,000
San Joaquin and Eastern Railroad	Sept. 19	Huntington Lake and tributaries	40,000
W. H. Thrower	Sept. 19	Balsam Creek	4,000
W. H. Thrower	Sept. 19	Alder Creek	2,000
W. H. Thrower	Sept. 19	Pitman Creek	4,000
		Total	106,000

GLENN COUNTY.

Distribution of Loch Leven Trout.

B. H. Mace	July 21	Brisco Creek	15,000
B. H. Mace	July 21	South Fork of Elk Creek	5,000
B. H. Mace	July 21	Grindstone Creek	17,000
B. H. Mace	July 21	Salt Creek	13,000
		Total	50,000

Distribution of Eastern Brook Trout.

B. H. Mace	July 21	Salt Creek	20,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
B. H. Mace	July 21	Brisco Creek	7,000
B. H. Mace	July 21	South Fork of Elk Creek	4,000
B. H. Mace	July 21	Cold Creek	25,000
B. H. Mace	July 21	Grindstone Creek	12,000
		Total	48,000

INYO COUNTY.

Distribution of Black Spotted Trout.

Mount Whitney Gun and Anglers' Club	July 28	Halwee Reservoir	15,000

Distribution of Loch Leven Trout.

Dick Eldred	July 28	Bishop Creek, South Fork	6,000
Hall & McAfee	July 28	Big Pine Creek	8,000
Mount Whitney Gun and Anglers' Club	July 28	Lubken Creek	4,000
Mount Whitney Gun and Anglers' Club	July 28	Tuttle Creek	4,000
Mount Whitney Gun and Anglers' Club	July 28	Lone Pine Creek	2,000
D. M. Nicoll	July 28	Olancha Creek	4,000
D. M. Nicoll	July 28	Shepherds Creek	4,000
D. M. Nicoll	July 28	Walker Creek	1,000
D. M. Nicoll	July 28	Olancha Creek	3,000
		Total	36,000

Distribution of Eastern Brook Trout.

Dick Eldred	July 28	Bishop Creek, North Fork	12,000
Hall & McAfee	July 28	Big Pine Creek	8,000
Mount Whitney Gun and Anglers' Club	July 28	Lubken Creek	4,000
Mount Whitney Gun and Anglers' Club	July 28	Tuttle Creek	4,000
Mount Whitney Gun and Anglers' Club	July 28	Lone Pine Creek	6,000
Mount Whitney Gun and Anglers' Club	July 28	Mirror Lake	6,000
Mount Whitney Gun and Anglers' Club	July 28	Consultation Lake	6,000
Mount Whitney Gun and Anglers' Club	July 28	Headwaters of Lone Pine Creek	8,000
Mount Whitney Gun and Anglers' Club	July 28	Bair Creek	6,000
D. M. Nicoll	July 28	Olancha Creek	4,000
D. M. Nicoll	July 28	Shepherds Creek	4,000
Carl Walters	July 28	Thieban Creek	4,000
Carl Walters	July 28	Lake at head of South Fork of Oak Creek	4,000
D. M. Nicoll	July 28	Walker Creek	1,000
D. M. Nicoll	July 28	Olancha Creek	3,000
Clyde Allen	July 28	Goodale Creek	2,000
Clyde Allen	July 28	Taboose Creek	2,000
		Total	84,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
Dick Eldred	July 28	Bishop Creek at Andrews Camp	5,000
Hall & McAfee	July 28	Tinemaha Creek	5,000
Hall & McAfee	July 28	Big Pine Creek	5,000
Carl Walters	July 28	Syms Creek	5,000
Carl Walters	July 28	Charles Creek	2,500
Carl Walters	July 28	Little Onion Valley, South Fork of Oak Creek	2,500
Clyde Allen	July 28	Goodale Creek	2,000
Clyde Allen	July 28	Taboose Creek	2,500
		Total	80,000

KERN COUNTY.

Distribution of Perch.

Arthur S. Crites	Oct. 12	Kern River	800

Distribution of Bass.

Arthur S. Crites	Oct. 12	Kern River	218

Distribution of Steelhead Trout.

Kern River Trout Club	Sept. 8	Cedar Creek	12,000
R. B. Martin	Sept. 8	Lumro Creek	4,500
F. G. Munzer	Sept. 8	Kern River	40,000
G. G. McKay	Sept. 8	Basin Creek	8,000
Arthur S. Crites	Oct. 5	Indian Creek	6,000
		Total	70,500

Distribution of Loch Leven Trout.

Kern River Trout Club	Sept. 8	Cedar Creek	12,000
Ed Tibbett	Sept. 8	McFarland Creek	6,000
		Total	18,000

Distribution of Rainbow Trout.

Kern River Trout Club	Sept. 8	Cedar Creek	12,000
R. B. Martin	Sept. 8	Lumro Creek	4,500
Ed Tibbett	Sept. 8	McFarland Creek	6,000
F. G. Munzer	Sept. 8	Kern River	10,000
Arp & Kaye	Sept. 9	Oak Creek	4,000
W. W. Laidley	Oct. 5	Cedar Creek	2,000
Al Cummings	Oct. 13	Cummings Reservoir	8,000
		Total	46,500

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

LAKE COUNTY.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
Mrs. Geo. Farley	Sept. 27	Alder Creek	5,000
Mrs. Geo. Farley	Sept. 27	Kelsey Creek	5,000
Mrs. Geo. Fields	Sept. 27	Kelsey Creek	5,000
Mrs. Geo. Fields	Sept. 27	Jones Creek	5,000
		Total	20,000

Distribution of Loch Leven Trout.

Allen Springs Co.	Sept. 27	Allen Creek	8,000

Distribution of Eastern Brook Trout.

Mrs. Geo. Farley	Sept. 27	Alder Creek	3,000
Mrs. Geo. Farley	Sept. 27	Kelsey Creek	3,000
Mrs. Geo. Fields	Sept. 27	Houten Creek	6,000
		Total	12,000

Distribution of Rainbow Trout.

Allen Springs Co.	Sept. 27	Allen Creek	8,000

LASSEN COUNTY.

Distribution of Blue Catfish.

F. A. Marsh	July 21	Tule Lake, 5 miles north of Plumas Junction	38

Distribution of Steelhead Trout.

F. D. Hall	Sept. 24	Willow Creek	8,000
Red River Lumber Co.	Sept. 24	Feather River	8,000
Frank P. Cady	Sept. 24	Susan River	10,000
Fish and Game Com.	Oct. 15	Juniper Lake	25,000
		Total	51,000

Distribution of Loch Leven Trout.

W. R. Horne	July 21	Smoke Creek	2,000
Red River Lumber Co.	Sept. 24	Clear Creek	10,000
Frank P. Cady	Sept. 24	Eagle Lake	16,000
Frank P. Cady	Sept. 24	Susan River	4,000
		Total	32,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Eastern Brook Trout.

Applicant	Date	Water stocked	Number
Homer C. Jack	July 21	Willow Creek	4,000
T. J. Dunlap	July 21	Ash Creek	6,000
		Total	10,000

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
W. R. Horne	July 21	Smoke Creek	6,000
Homer C. Jack	July 21	Willow Creek	4,000
T. J. Dunlap	July 21	Ash Creek	2,000
F. D. Hall	Sept. 24	Willow Creek	8,000
Red River Lumber Co	Sept. 24	Robbers Creek	10,000
Red River Lumber Co	Sept. 24	Feather River	2,000
Frank P. Cady	Sept. 24	Susan River	10,000
		Total	42,000

LOS ANGELES COUNTY.

Distribution of Bass.

Applicant	Date	Water stocked	Number
Mrs. Frankes	Oct. 6	Elizabeth Lake	30

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
Geo. E. Little	Oct. 13	Rio Hondo	6,000
H. I. Pritchard	Oct. 13	Topango Canyon	8,000
A. Adams, Jr.	Oct. 13	Big Tujunga	4,000
H. W. O'Melveny	Oct. 22	San Gabriel River	60,000
		Total	78,000

Distribution of Loch Leven Trout.

Applicant	Date	Water stocked	Number
H. W. O'Melveny	Oct. 6	San Gabriel River	4,000
H. W. O'Melveny	Oct. 6	San Gabriel River, east fork	4,000
H. W. O'Melveny	Oct. 6	San Gabriel River, north fork	6,000
H. W. O'Melveny	Oct. 6	San Gabriel River, west fork	4,000
H. W. O'Melveny	Oct. 6	San Gabriel River, Bear Canyon	4,000
H. W. O'Melveny	Oct. 6	San Gabriel River, Cattle Canyon	4,000
H. W. O'Melveny	Oct. 6	San Gabriel River, Soldier Creek	4,000
		Total	30,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
G. L. Baker	Oct. 7	Santa Anita River	2,000
Hurbert T. Mills	Oct. 6	San Dimas Canyon	4,000
H. W. O'Melveny	Oct. 6	San Gabriel River	16,000
H. W. O'Melveny	Oct. 6	San Gabriel River, east fork	6,000
H. W. O'Melveny	Oct. 6	San Gabriel River, north fork	6,000
H. W. O'Melveny	Oct. 6	San Gabriel River, west fork	6,000
H. W. O'Melveny	Oct. 6	San Gabriel River, Bear Canyon	6,000
H. W. O'Melveny	Oct. 6	San Gabriel River, Cattle Canyon	6,000
H. W. O'Melveny	Oct. 6	San Gabriel River, Soldier Creek	6,000
T. J. Opid	Oct. 6	Rocky Gulch of west fork of San Gabriel River	2,000
T. J. Opid	Oct. 6	West Fork of San Gabriel River	2,000
E. De Vor	Oct. 6	West Fork of San Gabriel River	6,000
A. Adams, Jr.	Oct. 13	Big Tujunga	16,000
		Total	84,000

MADERA COUNTY.

Distribution of Rainbow Trout.

A. D. Ferguson	Sept. 3	North Fork San Joaquin River	26,000

MARIN COUNTY.

Distribution of Steelhead Trout.

California Anglers' Assn.	Aug. 21	Lake Lagunitas	90,000
California Anglers' Assn.	Aug. 21	San Geronimo Creek	35,000
California Anglers' Assn.	Aug. 21	Paper Mill Creek	75,000
California Anglers' Assn.	Aug. 21	Olema Creek	50,000
W. G. Domerque	Sept. 27	Steep Ravine	25,000
W. G. Domerque	Sept. 27	Muir Woods	25,000
		Total	300,000

MARIPOSA COUNTY.

Distribution of Rainbow Trout.

Edwin T. Huffman	Sept. 3	Miami Creek	10,000
Yosemite Valley R. R. Co.	Sept. 30	Merced River, from Busburg to El Portal	56,000
C. B. Hollingsworth	Sept. 30	Cascade Creek	4,000
		Total	70,000

Distribution of Loch Leven Trout.

Edwin T. Huffman	Sept. 3	Merced River, south fork	10,000
Yosemite Valley R. R. Co.	Sept. 30	Merced River, from Busburg to El Portal	55,000
C. B. Hollingsworth	Sept. 30	Cascade Creek	4,000
		Total	70,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Black Spotted Trout.

Applicant	Date	Water stocked	Number
Yosemite Valley R. R. Co.	Sept. 30	Merced River, from Busburg to El Portal	60,000

Distribution of Steelhead Trout.

Yosemite Valley R. R. Co.	Sept. 30	Merced River, from Busburg to El Portal	40,000

MENDOCINO COUNTY.

Distribution of Steelhead Trout.

California Western R. R. and Navigation Co.	June 4	Noyo River	320,000
California Western R. R. and Navigation Co.	June 4	Pudding Creek	44,000
P. H. Anderson	June 4	Albion River	20,000
California Western R. R. and Navigation Co.	Aug. 7	Noyo River	184,000
		Total	568,000

Distribution of Eastern Brook Trout.

California Western R. R. and Navigation Co.	June 4	Hare Creek	12,000

MODOC COUNTY.

Distribution of Blue Catfish.

J. T. Spaulding	July 21	Hackmore Reservoir	46

Distribution of Loch Leven Trout.

Irvin Kistler	July 21	Barber Creek	2,000
Irvin Kistler	July 21	Emerson Creek	2,000
T. S. Kemple	July 21	Shields Creek	2,000
Stanley A. McIntosh	July 23	Pine Creek	6,000
		Total	12,000

Distribution of Eastern Brook Trout.

Grover Wimer	July 21	Mill Creek	6,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
Grover Wimer	July 21	Mill Creek	6,000
Irvin Kistler	July 21	Eagle Creek	2,000
Irvin Kistler	July 21	Rader Creek	2,000
T. S. Kemple	July 21	Shields Creek	4,000
Stanley A. McIntosh	July 23	Pine Creek	6,000
		Total	20,000

MONO COUNTY.

Distribution of Loch Leven Trout.

W. M. Maule	Aug. 17	West Walker River	4,000
W. M. Maule	Aug. 17	East Fork West Walker River	2,000
W. M. Maule	Aug. 17	Little Twin L's West Walker Watershed	4,000
W. M. Maule	Aug. 17	Horseshoe L's east of Leavitt Meadow	4,000
W. M. Maule	Aug. 17	Lake at head of Silver Creek	2,000
W. M. Maule	Aug. 17	Junction Reservoir	2,000
W. M. Maule	Aug. 17	Molybdenite Lake	2,000
		Total	20,000

Distribution of Eastern Brook Trout.

W. M. Maule	Aug. 17	Headwaters of West Walker River	4,000
W. M. Maule	Aug. 17	Lost Canyon and Mill Creek	4,000
W. M. Maule	Aug. 17	Molybdenite Creek	2,000
W. M. Maule	Aug. 17	Sawyer Creek	2,000
W. M. Maule	Aug. 17	Willow Flats, Molybdenite Watershed	2,000
		Total	14,000

MONTEREY COUNTY.

Distribution of Steelhead Trout.

W. M. Casey	Aug. 4	Nacimiento River	42,500
W. M. Casey	Aug. 4	Arroyo Seco	20,000
W. M. Casey	Aug. 4	San Antonio	62,500
		Total	125,000

Distribution of Loch Leven Trout.

S. E. Whitcher	July 8	Los Vaquero	9,000
S. E. Whitcher	July 8	Horse Canyon	3,500
Jno. L. D. Roberts	July 7	Carmel River	22,500
Jno. L. D. Roberts	Aug. 5	Carmel River at Miller Canyon	22,500
		Total	57,500

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
Paul Tabbott	July 8	Arroyo Seco	15,000
S. E. Whitcher	July 8	Horse Canyon	6,000
S. E. Whitcher	July 8	Piney Creek	12,000
S. E. Whitcher	July 7	Arroyo Seco	6,500
Chas. H. Culp	July 7	White Rock Creek	9,000
W. M. Casey	Aug. 4	Nacimiento River	7,500
W. M. Casey	Aug. 4	Arroyo Seco	5,000
W. M. Casey	Aug. 4	San Antonio	12,500
		Total	73,500

NAPA COUNTY.

Distribution of Rainbow Trout.

Theo. A. Bell	Sept. 27	Bells Creek	21,000

Distribution of Steelhead Trout.

Clifford N. Clark	May 30	Trout Creek	21,000
Clifford N. Clark	May 30	Copelle Creek	21,000
Geo. H. Warford	May 30	Lake Madigan	75,000
Geo. H. Warford	May 30	Lake Frey	45,000
C. H. Drake	May 30	Ritchie Creek	36,000
Henry Feige	May 30	Feige Creek	12,000
F. W. Mielem	May 30	Upper Conn Creek	24,000
J. P. Orr	May 30	Soscol Creek	18,000
William West	May 30	Napa Creek	60,000
Bismark Bruck	Sept. 27	Lyman Creek	2,000
Bismark Bruck	Sept. 27	Conn Creek	2,000
Warren C. Steves	Sept. 27	Conn Creek	4,000
Warren C. Steves	Sept. 27	Chiles Creek	6,000
Warren C. Steves	Sept. 27	York Creek	6,000
Warren C. Steves	Sept. 27	Sage Creek	4,000
		Total	336,000

NEVADA COUNTY.

Distribution of Steelhead Trout.

W. B. Tubbs	Sept. 15	Webber Lake	8,000
Truckee Chamber of Com.	Oct. 2	Donner Lake	200,000
		Total	208,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Loch Leven Trout.

Applicant	Date	Water stocked	Number
J. F. Swears	July 1	Yuba River	6,000
J. F. Swears	July 1	Lake Van Norden	6,000
Mrs. Geo. W. Kenny	July 1	Lake Independence	9,000
E. F. Steward	July 1	Lake Flora	6,000
E. F. Steward	July 1	Willow Lake	6,000
S. F. Fly Casting Club	July 1	Union Mill's Pond	39,000
Pacific Gas and Electric Co.	Sept. 4	Lake Spaulding tributaries, Fordyce Creek	15,000
Pacific Gas and Electric Co.	Sept. 4	South Yuba River	15,000
Pacific Gas and Electric Co.	Sept. 4	Bloody Run	16,000
		Total	118,000

Distribution of Eastern Brook Trout.

Applicant	Date	Water stocked	Number
Stewart McKay	July 1	Rionarson Creek	12,000
J. F. Swears	July 1	Yuba River	5,000
J. F. Swears	July 1	Lake Van Norton	4,000
Mrs. Geo. W. Kenny	July 1	Lake Independence	9,000
W. B. Tubbs	Sept. 15	Webber Lake	2,000
W. B. Tubbs	Sept. 15	Lake of the Woods	3,000
The Boca Mill Co.	Sept. 15	Juniper Creek	10,000
Grass Valley Sportsman	Sept. 23	Green Horn	6,000
Grass Valley Sportsman	Sept. 23	South Yuba River	14,000
Grass Valley Sportsman	Sept. 23	Rattle Snake	2,000
Grass Valley Sportsman	Sept. 23	Wolf Creek	4,000
Grass Valley Sportsman	Sept. 23	Bear River Canal	4,000
		Total	75,000

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
Mrs. Geo. W. Kenny	July 1	Lake Independence	12,000
S. F. Fly Casting Club	Aug. 15	Union Mill's Pond	60,000
Ever Bros.	Aug. 15	Ever Creek	16,000
Sierra Nevada W. & L. Co.	Aug. 15	Prosser Creek	21,000
Sierra Nevada W. & L. Co.	Aug. 15	Sage Hen Creek	9,000
M. L. West	Aug. 15	South Yuba River	8,000
Pacific Gas and Electric Co.	Sept. 4	Lake Spaulding tributaries, Fordyce Creek	15,000
Pacific Gas and Electric Co.	Sept. 4	South Yuba River	15,000
Pacific Gas and Electric Co.	Sept. 4	Bloody Run	12,000
The Boca Mill Co.	Sept. 4	Little Truckee	30,000
Nevada City Sportsman Club	Sept. 21	Deer Creek	36,000
Nevada City Sportsman Club	Sept. 21	Rock Creek	14,000
Grass Valley Sportsman Club	Sept. 23	Bouman Lake	20,000
Grass Valley Sportsman Club	Sept. 23	Fancherie Lake	8,000
Grass Valley Sportsman Club	Sept. 23	Saw Mill Lake	8,000
Grass Valley Sportsman Club	Sept. 23	Bear River	30,000
Grass Valley Sportsman Club	Sept. 23	Green Horn	8,000
Grass Valley Sportsman Club	Sept. 23	South Yuba River	14,000
Grass Valley Sportsman Club	Sept. 23	Rattle Snake	2,000
		Total	338,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

ORANGE COUNTY.

Distribution of Catfish.

Applicant	Date	Water stocked	Number
A. J. McFadden	Oct. 13	Laguna Lake	27

Distribution of Sunfish.

H. M. Tracy	Oct. 13	School Pond and aquarium	15

Distribution of Steelhead Trout.

W. F. Adkinson	Oct. 13	Trabuso	6,000
A. F. Forester	Oct. 13	San Juan Creek	6,000
A. F. Forester	Oct. 13	Trabuso	6,000
		Total	18,000

Distribution of Rainbow Trout.

W. F. Adkinson	Oct. 13	Trabuso	4,000

PLACER COUNTY.

Distribution of Rainbow Trout.

Frank L. Harmon	July 1	Canyon Creek	15,000
A. G. McFarland	July 1	South Yuba River	6,000
Lake Tahoe R. & T. Co.	Aug. 16	Ward Creek	12,000
Miss Katherine Chandler	Aug. 16	Bear Creek	6,000
C. Frederick Kohl	Aug. 16	Blackwood Creek	4,000
H. M. Freeman	Aug. 16	South Yuba River	14,000
Placer F. and H. P. Assn.	Sept. 4	Clipper Ravine	4,000
Placer F. and H. P. Assn.	Sept. 4	Wessley Creek	2,000
North Fork G. Pro. Assn.	Sept. 4	Dutch Ravine	2,000
North Fork G. Pro. Assn.	Sept. 4	Secret Ravine	1,000
North Fork G. Pro. Assn.	Sept. 4	Cook and Boggs Ravine	1,000
North Fork G. Pro. Assn.	Sept. 4	American River, north of North Fork	10,000
North Fork Assn.	Sept. 15	American River, North Fork	15,000
Lawrence & Comstock	Sept. 16	Brockway Creek	6,000
William Taft	Sept. 16	Rock Creek	4,000
Lake Tahoe R. & T. Co.	Sept. 16	Burton Creek	12,000
Fish and Game Com.	Sept. 21	Truckee River	10,000
E. A. Garrison	Oct. 24	Volcano Creek	8,000
E. A. Garrison	Oct. 24	Shirttail Creek	10,000
E. A. Garrison	Oct. 24	El Dorado Creek	8,000
E. A. Garrison	Oct. 24	Big Secret Creek	8,000
E. A. Garrison	Oct. 24	Screw Augur Creek	8,000
E. A. Garrison	Oct. 24	Devils Canyon	8,000
		Total	174,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Eastern Brook Trout.

Applicant	Date	Water stocked	Number
W. A. Buckman	July 1	Cold Stream	15,000
H. M. Freeman	July 1	South Yuba River	12,000
J. B. Knapp	July 1	Blue Canyon Creek	6,000
J. B. Knapp	July 1	North Fork of American River	6,000
E. F. Stewart	July 1	Castle Creek	9,000
Lake Tahoe R. & T. Co.	Aug. 16	Ward Creek	12,000
F. H. Scott	Aug. 16	Squaw Creek	20,000
Miss Katherine Chandler	Aug. 16	Five Lakes	4,000
W. J. McCleary	Aug. 15	Brushy Canyon	9,000
W. J. McCleary	Aug. 15	Shirttail Canyon	9,000
W. J. McCleary	Aug. 15	North Fork of American River	9,000
C. Frederick Kohl	Aug. 16	Blackwood Creek	8,000
E. L. Mooney	Sept. 4	South Yuba River	2,000
Pacific Gas and Elec. Co.	Sept. 4	Lake Valley	14,000
North Fork Assn.	Sept. 15	American River, North Fork	4,000
Tahoe Vista I. Co.	Sept. 16	Griff Creek	4,000
Lawrence & Comstock	Sept. 16	Brockway Creek	4,000
Lake Tahoe R. & T. Co.	Sept. 16	Burton Creek	8,000
		Total	155,000

Distribution of Loch Leven Trout.

H. M. Freeman	July 1	Loch Leven Lake	15,000
A. G. McFarland	July 1	South Yuba River	6,000
Lake Tahoe R. & T. Co.	Aug. 16	Ward Creek	12,000
Miss Katherine Chandler	Aug. 16	Five Lakes	6,000
Placer F. and H. Pr. Assn.	Sept. 4	Clipper Ravine	2,000
Placer F. and H. Pr. Assn.	Sept. 4	Wessley Creek	2,000
Placer F. and H. Pr. Assn.	Sept. 2	Codfish Creek	2,000
E. L. Mooney	Sept. 2	South Yuba River	4,000
North Fork G. Pro. Assn.	Sept. 2	Dutch Ravine	2,000
North Fork G. Pro. Assn.	Sept. 2	Secret Ravine	1,000
North Fork G. Pro. Assn.	Sept. 2	Cook and Boggs Ravine	1,000
North Fork G. Pro. Assn.	Sept. 2	American River	10,000
Pacific Gas and Elec. Co.	Sept. 2	Lake Valley	14,000
North Fork Assn.	Sept. 15	American River, North Fork	8,000
Tahoe Vista I. Co.	Sept. 16	Griff Creek	4,000
Lawrence & Comstock	Sept. 16	Brockway Creek	4,000
Fish and Game Com.	Sept. 21	Truckee River	6,000
		Total	99,000

Distribution of Steelhead Trout.

H. A. Snelling	Oct. 24	Antelope Ravine	8,000
F. R. Payne and R. Fowler	Oct. 24	Canyon Creek	8,000
		Total	16,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

PLUMAS COUNTY.

Distribution of Loch Leven Trout.

Applicant	Date	Water stocked	Number
Grizzly Ice Co.	June 13	Grizzly Ice Lake	12,000
Portola Chamber of Com.	June 18	Grizzly Creek	18,000
C. N. Johnson and J. B. Sutton	June 18	Smith Creek	9,000
C. N. Johnson and J. B. Sutton	June 18	Gray Eagle Creek	9,000
Charles Belden	June 18	Chipps Creek	6,000
Charles Belden	June 18	Indian Creek	3,000
N. P. Nelson	June 18	Yellow Creek	6,000
A. L. Andrews	June 18	Feather River	42,000
Leo M. Nevis	June 18	Feather River	12,000
I. C. Zant	June 18	Feather River	39,000
Roger T. Remick	June 15	Bonta Creek	20,000
Robert Canonica	July 15	Last Chance Creek	2,500
Portola Chamber of Com.	July 21	Grizzly Creek	5,000
Mrs. M. P. Rogers	July 21	Milk Ranch Creek	12,500
		Total	196,000

Distribution of Eastern Brook Trout.

Grizzly Ice Co.	June 18	Grizzly Creek	9,000
Portola Chamber of Com.	June 18	Grizzly Creek	18,000
Johnsville Boat Club	June 18	Eureka Lake	12,000
Johnsville Boat Club	June 18	Jamison Lake	12,000
Charles Belden	June 18	Indian Creek	3,000
Charles Belden	June 18	Yellow Creek	6,000
N. P. Nelson	June 18	Indian Creek	3,000
N. P. Nelson	June 18	Chipps Creek	3,000
Leo M. Nevis	June 18	Chambers Creek	6,000
H. G. Porter	July 15	Mill Creek	14,400
H. G. Porter	July 15	Little Spanish Creek	6,600
W. G. Hottman	July 15	Clear Creek	4,000
Portola Chamber of Com.	July 21	Grizzly Creek	5,000
W. H. Day	July 21	Jackass Creek	5,000
W. H. Day	July 21	Chambers Creek	5,000
B. D. Maynard	July 21	Rock Creek	15,000
		Total	127,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
Johnson & Sutton	July 14	Gray Eagle	6,000
A. T. Walker	July 14	East Branch Chipps River	4,000
A. T. Walker	July 14	Yellow Creek	4,000
A. T. Walker	July 14	Chambers Creek	4,000
Geo. A. Sanborn	July 15	Feather River, south fork	12,000
Roger T. Remick	July 15	Bonta Creek	12,000
Portola Chamber of Com.	July 15	Grizzly Creek	18,000
Leo M. Nevis	July 15	Jackass Creek	10,500
Leo M. Nevis	July 15	Feather River	1,500
N. P. Nelson	July 15	Chipps Creek	3,000
N. P. Nelson	July 15	Yellow Creek	3,000
W. G. Hottman	July 15	Mill Creek	9,000
Chas. Belden	July 15	Chipps Creek	6,000
Chas. Belden	July 15	Yellow Creek	3,000
Dr. J. A. Barr	July 15	Lost Creek	48,000
Oro Electric Corp.	July 15	Yellow Creek	15,000
Robert Canonica	July 15	Last Chance Creek	9,000
I. C. Zent	July 21	Feather River	30,000
Portola Chamber of Com.	July 21	Grizzly Creek	15,000
A. J. Stanley	July 21	Chambers Creek	9,000
A. J. Stanley	July 21	Milk Ranch Creek	9,000
Johnson & Sutton	July 21	Smith Creek	6,000
W. H. Day	July 21	Feather River	3,000
A. L. Andrews	July 21	Feather River	24,000
A. L. Andrews	July 21	Jackass Creek	6,000
		Total	270,000

Distribution of Steelhead Trout.

W. G. Hottman	July 21	Kellogg Creek	4,000
W. G. Hottman	July 21	Mill Creek	8,000
		Total	12,000

RIVERSIDE COUNTY.

Distribution of Loch Leven Trout.

H. I. Ruess	Oct. 18	Dark Canyon	6,000
H. I. Ruess	Oct. 18	Fuller Creek	2,000
		Total	8,000

Distribution of Rainbow Trout.

F. S. Johnson	Oct. 6	Coldwater Creek	4,000
H. I. Ruess	Oct. 13	Dark Canyon	2,000
H. I. Ruess	Oct. 18	Fuller Creek	2,000
		Total	8,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

SACRAMENTO COUNTY.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
R. Warren	Aug. 21	Upper Mokelumne River	7,500
Geo. Neale	Sept. 8	South Side Park	6,000
		Total	13,500

SAN BENITO COUNTY.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
Fred W. Boyns	July 8	Los Viboras Creek	18,000

Distribution of Eastern Brook Trout.

Applicant	Date	Water stocked	Number
E. A. Pearce	July 7	San Juan Canyon Creek	5,000

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
E. A. Pearce	July 7	San Juan Canyon Creek	12,000

SAN BERNARDINO COUNTY.

Distribution of Black Bass.

Applicant	Date	Water stocked	Number
S. Guasti	Oct. 18	Guasti Reservoir	45

Distribution of Loch Leven Trout.

Applicant	Date	Water stocked	Number
W. C. Malone	Oct. 6	Devil Canyon	4,000
W. C. Malone	Oct. 6	Forest Home Stream	4,000
F. Culver	Oct. 6	Fish Creek	6,000
L. M. King	Oct. 6	Mountain Home Stream, east fork	2,000
L. M. King	Oct. 6	Forscee Creek	2,000
L. M. King	Oct. 6	Upper Santa Ana	4,000
		Total	22,000

Distribution of Eastern Brook Trout.

Applicant	Date	Water stocked	Number
F. Culver	Oct. 6	Falls Creek, north fork	2,000
F. Culver	Oct. 6	Falls Creek, east fork	2,000
F. Culver	Oct. 6	South tributary Mill Creek	4,000
		Total	8,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
W. C. Malone	Oct. 6	Lytle Creek	16,000
W. C. Malone	Oct. 6	Waterman Canyon	4,000
F. Culver	Oct. 6	Mill Creek, upper	4,000
F. Culver	Oct. 6	Alder Creek	2,000
Mark Krysto	Oct. 6	Cucamonga Canyon	4,000
L. M. King	Oct. 6	Barton Creek	4,000
L. M. King	Oct. 6	South Fork	2,000
L. M. King	Oct. 6	Upper Santa Ana	6,000
		Total	42,000

SAN DIEGO COUNTY.

Distribution of Rainbow Trout.

Webb Toms	Oct. 18	Pine Creek	4,000
Webb Toms	Oct. 18	Boulder Creek	2,000
Webb Toms	Oct. 18	Cuyamaca Lake	2,000
S. C. Dickson	Oct. 18	Pauma Creek	10,000
S. C. Dickson	Oct. 18	Lion Creek	2,000
Ed Fletcher	Oct. 18	Cauda Verde Creek	2,000
Ed Fletcher	Oct. 18	Mataqual Creek	2,000
Ed Fletcher	Oct. 18	Dehr Creek	2,000
Ed Fletcher	Oct. 18	Cedar Creek	2,000
DeWitt C. Mitchell	Oct. 18	Cedar Creek	8,000
		Total	36,000

Distribution of Eastern Brook Trout.

S. C. Dickson	Oct. 18	Pauma Creek	2,000
S. C. Dickson	Oct. 18	Lion Creek	2,000
Ed Fletcher	Oct. 18	Cauda Verde Creek	2,000
Ed Fletcher	Oct. 18	Mataqual Creek	2,000
		Total	8,000

Distribution of Loch Leven Trout.

S. C. Dickson	Oct. 18	Pauma Creek	4,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

SAN LUIS OBISPO COUNTY.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
Dr. C. S. Noble	June 26	Lopez Creek	20,000
Dr. C. S. Noble	June 26	Arroyo Grande Creek	30,000
Dr. C. S. Noble	June 26	Tar Spring Creek	10,000
San Luis G. and R. Club	June 26	See Canyon Creek	15,000
San Luis G. and R. Club	June 26	Coon Creek	12,000
San Luis G. and R. Club	June 26	Islay Creek	15,000
San Luis G. and R. Club	June 26	Copper Mine Creek	3,000
San Luis G. and R. Club	June 26	San Luis Creek	30,000
San Luis G. and R. Club	June 26	Corral de Pedro	13,000
San Luis G. and R. Club	June 26	Steiner Creek	12,000
San Luis G. and R. Club	June 26	Upper Choro	12,000
San Luis G. and R. Club	June 26	Lower Choro	12,000
San Luis G. and R. Club	June 26	Morro	12,000
San Luis G. and R. Club	June 26	Torro	12,000
San Luis G. and R. Club	June 26	Old Creek	6,000
San Luis G. and R. Club	June 26	Clark Valley Creek	6,000
Santa Maria R. and G. Club	June 26	Twin Lake	10,000
Santa Maria R. and G. Club	June 26	Celery Lake	20,000
Santa Maria R. and G. Club	June 26	Pipe Line Lake	10,000
H. J. Abels	July 8	Alamo	6,000
		Total	266,000

Distribution of Loch Leven Trout.

Applicant	Date	Water stocked	Number
Colony Holding Corp	June 26	Santa Margarita	9,000
Colony Holding Corp	June 26	Graves Creek	3,000
Santa Maria R. and G. Club	June 26	Mud Lake	8,000
Santa Maria R. and G. Club	June 26	White Lake	7,000
		Total	27,000

Distribution of Eastern Brook Trout.

Applicant	Date	Water stocked	Number
Colony Holding Corp	June 26	Atascadero Creek	9,000

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
P. H. Murphy	June 26	Atascadero Creek	7,500
P. H. Murphy	June 26	San Simeon Creek	10,000
P. H. Murphy	June 26	Berros Creek	3,500
Dr. C. S. Noble	June 26	Lopez Creek	3,000
Dr. C. S. Noble	June 26	Arroyo Grande Creek	3,000
Dr. C. S. Noble	June 26	Tar Spring Creek	3,000
San Luis G. and R. Club	June 26	Islay Creek	3,000
San Luis G. and R. Club	June 26	Copper Mine Creek	3,000
San Luis G. and R. Club	June 26	San Luis Creek	15,000
San Luis G. and R. Club	June 26	Corral de Pedro	3,000
San Luis G. and R. Club	June 26	Steiner Creek	3,000
San Luis G. and R. Club	June 26	Upper Choro	3,000
San Luis G. and R. Club	June 26	Lower Choro	3,000
San Luis G. and R. Club	June 26	Morro	3,000
San Luis G. and R. Club	June 26	Torro	3,000
		Total	69,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

SAN MATEO COUNTY.

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
Ocean Shore R. R. Co.	June 20	Purisima Creek	60,000
Ocean Shore R. R. Co.	June 20	Corte Madera Creek	20,000
		Total	80,000

Distribution of Steelhead Trout.

Ocean Shore R. R. Co.	June 20	Tobin Creek	32,000
Ocean Shore R. R. Co.	June 20	Higgin Creek	44,000
Ocean Shore R. R. Co.	June 20	Lobitos Creek	60,000
Ocean Shore R. R. Co.	June 20	Tunitas Creek	40,000
Ocean Shore R. R. Co.	June 20	Harrington Creek	60,000
Ocean Shore R. R. Co.	June 20	San Gregoria Creek	84,000
Jos. B. Fleming	June 20	San Pedro Creek	40,000
Butana L. and Dev. Co.	Sept. 8	Butano Creek	10,000
McCormick & Son	Sept. 8	Butano Creek	10,000
Herbert E. Law	Oct. 6	Corte Madera Creek	20,000
		Total	400,000

SANTA BARBARA COUNTY.

Distribution of Quinnat Salmon.

H. J. Abels	July 8	Santa Ynez River	25,000

Distribution of Steelhead Trout.

H. J. Abels	July 8	Salsipuedes Creek	6,000
H. J. Abels	July 8	Miguelito	6,000
H. J. Abels	July 8	Santa Ynez River	30,000
H. J. Abels	July 8	Tepusquet	6,000
H. J. Abels	July 8	Guadalupe Creek	6,000
H. J. Abels	July 8	Dos Pueblos	21,000
H. J. Abels	July 8	Santa Ynez River	60,000
H. S. Deaderick	Oct. 7	Arroyo Padaro	3,000
H. S. Deaderick	Oct. 7	Rincon Creek	3,000
H. S. Deaderick	Oct. 7	Carpinteria Creek	3,000
H. S. Deaderick	Oct. 7	Gobenerdor Creek	3,000
		Total	147,000

Distribution of Loch Leven Trout.

H. J. Abels	July 8	Sisquoc	7,500
H. J. Abels	July 8	Manzana	2,500
H. J. Abels	July 8	Tepusquet	2,500
		Total	12,500

Distribution of Eastern Brook Trout.

H. J. Abels	July 8	Sisquoc	10,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

SANTA CLARA COUNTY.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
Earle Downing	June 9	Calaveras Creek	10,000
Earle Downing	June 9	Bear Creek	8,000
Earle Downing	June 9	Valpe Creek	8,000
C. H. Squire	Aug. 8	Los Gatos	15,000
		Total	41,000

Distribution of Rainbow Trout.

I. L. Koppel	July 7	Smiths Creek	30,000

SHASTA COUNTY.

Distribution of Rainbow Trout.

C. L. Watson	July 8	Clear Creek	10,000
C. L. Watson	July 8	Five Mile Gulch	2,500
C. L. Watson	July 8	Mill Creek	2,500
Hazel Gold Mining Co.	July 8	Crystal Creek	7,500
Hazel Gold Mining Co.	July 8	Kliens Gulch	2,500
W. H. Logan	July 8	Eagle Creek	5,000
W. H. Logan	July 8	East Fork of Cottonwood	7,500
W. H. Logan	July 8	South Fork of Cottonwood	5,000
Alex Hansen	Aug. 22	Cedar Creek	2,500
Alex Hansen	Aug. 22	Cow Creek	2,500
Alex Hansen	Aug. 22	Willow Creek	2,500
Alex Hansen	Aug. 22	Montgomery Creek	2,500
H. O. Wicks	Aug. 25	Sacramento River	8,000
Harmon Bell	Aug. 26	Sacramento River	10,000
Dunsmuir Promotion Club	Aug. 29	Little Castle Creek	16,000
Dunsmuir Promotion Club	Aug. 29	Soda Creek	39,000
Dunsmuir Promotion Club	Aug. 29	Little Soda Creek	5,000
Seymour S. Bass	Aug. 29	McCloud River	40,000
Sacramento Valley Eastern R. R.	Aug. 29	Dedalles Creek	10,000
J. L. Barham	Sept. 8	Rock Creek	4,000
		Total	184,500

Distribution of Bass.

E. W. Ehmann	Nov. 1	Harbison Reservoir	40

Distribution of Steelhead Trout.

H. O. Wicks	Aug. 25	Sacramento River	8,000
Harmon Bell	Aug. 26	Sacramento River	12,000
J. L. Barham	Sept. 8	Rock Creek	8,000
Dunsmuir Promotion Club	Oct. 17	Little Castle Creek	100,000
Dunsmuir Promotion Club	Oct. 17	Sacramento River	150,000
		Total	278,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Loch Leven Trout.

Applicant	Date	Water stocked	Number
C. L. Watson	July 8	Clear Creek	10,000
C. L. Watson	July 8	Five Mile Gulch	2,500
C. L. Watson	July 8	Mill Creek	2,500
Hazel Gold Mining Co.	July 8	Crystal Creek	2,500
Hazel Gold Mining Co.	July 8	Kliens Gulch	2,500
Dunsmuir Promotion Club	Aug. 29	Little Castle Creek	16,000
Dunsmuir Promotion Club	Aug. 29	Soda Creek	39,000
Dunsmuir Promotion Club	Aug. 29	Little Soda Creek	5,000
Sacramento Valley Eastern R. R.	Aug. 29	Dedalles Creek	10,000
		Total	90,000

SIERRA COUNTY.

Distribution of Steelhead Trout.

Webber Lake Club	Sept. 21	Webber Lake	16,000
Webber Lake Club	Sept. 21	Lake of the Woods	6,000
		Total	22,000

Distribution of Loch Leven Trout.

R. W. Thorne	July 15	Loyalton Creek	5,000
R. W. Thorne	July 15	Turner Creek	5,000
R. W. Thorne	July 15	Bodinach Creek	5,000
G. F. Edwards	July 21	Gold Lake	10,000
A. S. Nichols	Sept. 15	Cool Creek	6,000
A. S. Nichols	Sept. 15	Morgan Creek	2,000
A. S. Nichols	Sept. 15	Miller Creek	2,000
		Total	35,000

Distribution of Eastern Brook Trout.

W. B. Tubbs	July 1	Inlet to Webber Lake	18,000
G. F. Edwards	July 21	Gold Lake	5,000
		Total	23,000

Distribution of Rainbow Trout.

W. B. Tubbs	July 1	Inlet to Webber Lake	18,000
R. W. Thorne	July 15	Loyalton Creek	7,000
R. W. Thorne	July 15	Turner Creek	7,000
R. W. Thorne	July 15	Bodinach Creek	7,000
A. S. Nichols	Sept. 15	Cool Creek	2,000
A. S. Nichols	Sept. 15	Morgan Creek	2,000
A. S. Nichols	Sept. 15	Miller Creek	2,000
		Total	45,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

SISKIYOU COUNTY.

Distribution of Quinnat Salmon.

Applicant	Date	Water stocked	Number
Fish and Game Com.	Jan. 23	Cold Creek, tributary to Sacramento River	597,000
Fish and Game Com.	Jan. 25	Cold Creek, tributary to Sacramento River	692,000
Fish and Game Com.	Jan. 26	Sullaway Creek, tributary to Sacramento River	608,000
Fish and Game Com.	Jan. 27	Schoolhouse Creek, tributary to Sac. River	645,000
Fish and Game Com.	Jan. 28	Sullaway Creek, tributary to Sacramento River	847,000
Fish and Game Com.	Jan. 29	Spring Creek, tributary to Sacramento River	435,000
Fish and Game Com.	Jan. 30	Cold Creek, tributary to Sacramento River	181,000
Fish and Game Com.	Jan. 31	Sullaway Creek, tributary to Sacramento River	428,000
Fish and Game Com.	Feb. 5	Spring Creek, tributary to Sacramento River	655,000
Fish and Game Com.	Feb. 13	Schoolhouse Creek, tributary to Sac. River	400,000
Fish and Game Com.	Feb. 15	Schoolhouse Creek, tributary to Sac. River	650,000
Fish and Game Com.	Feb. 17	Spring Creek, tributary to Sacramento River	400,000
Fish and Game Com.	Feb. 18	Sullaway Creek, tributary to Sacramento River	550,000
Fish and Game Com.	Feb. 22	Sullaway Creek, tributary to Sacramento River	756,000
Fish and Game Com.	Feb. 23	Spring Creek, tributary to Sacramento River	300,000
Fish and Game Com.	Feb. 26	Sullaway Creek, tributary to Sacramento River	634,000
Fish and Game Com.	Feb. 27	Schoolhouse Creek, tributary to Sac. River	500,000
Fish and Game Com.	Mar. 1	Schoolhouse Creek, tributary to Sac. River	776,000
Fish and Game Com.	Mar. 2	Spring Creek, tributary to Sacramento River	600,000
Fish and Game Com.	Mar. 3	Cold Creek, tributary to Sacramento River	653,000
Fish and Game Com.	Mar. 5	Cold Creek, tributary to Sacramento River	500,000
Fish and Game Com.	Mar. 8	Cold Creek, tributary to Sacramento River	686,000
Fish and Game Com.	Mar. 10	Spring Creek, tributary to Sacramento River	600,000
Fish and Game Com.	Mar. 11	Cold Creek, tributary to Sacramento River	600,000
Fish and Game Com.	Mar. 13	Schoolhouse Creek, tributary to Sac. River	605,000
Fish and Game Com.	Mar. 16	Sullaway Creek, tributary to Sacramento River	500,000
Fish and Game Com.	Mar. 17	Sullaway Creek, tributary to Sacramento River	500,000
Fish and Game Com.	Mar. 18	Sullaway Creek, tributary to Sacramento River	389,000
Fish and Game Com.	Mar. 30	Cold Creek, tributary to Sacramento River	500,000
Fish and Game Com.	Mar. 31	Cold Creek, tributary to Sacramento River	602,000
Fish and Game Com.	April 5	Cold Creek, tributary to Sacramento River	500,000
Fish and Game Com.	April 6	Cold Creek, tributary to Sacramento River	500,000
Fish and Game Com.	April 7	Spring Creek, tributary to Sacramento River	507,000
Fish and Game Com.	April 11	Sullaway Creek, tributary to Sacramento River	500,000
Fish and Game Com.	April 12	Sullaway Creek, tributary to Sacramento River	500,000
Fish and Game Com.	April 14	Cold Creek, tributary to Sacramento River	506,000
Fish and Game Com.	April 15	Sullaway Creek, tributary to Sacramento River	400,000
Fish and Game Com.	April 17	Sullaway Creek, tributary to Sacramento River	500,000
Fish and Game Com.	April 18	Sullaway Creek, tributary to Sacramento River	477,000
Fish and Game Com.	April 20	Spring Creek, tributary to Sacramento River	809,000
Fish and Game Com.	April 22	Sullaway Creek, tributary to Sacramento River	654,000
Fish and Game Com.	April 25	Cold Creek, tributary to Sacramento River	600,000
Fish and Game Com.	April 26	Cold Creek, tributary to Sacramento River	358,000
Fish and Game Com.	April 27	Cold Creek, tributary to Sacramento River	800,000
Fish and Game Com.	April 28	Cold Creek, tributary to Sacramento River	500,000
Fish and Game Com.	April 29	Sullaway Creek, tributary to Sacramento River	555,000
Fish and Game Com.	April 30	Cold Creek, tributary to Sacramento River	500,000
Fish and Game Com.	May 2	Klamath River	450,000
Fish and Game Com.	May 4	Klamath River	200,000
Fish and Game Com.	Oct. 8	Cold Creek, tributary to Sacramento River	50,000
Fish and Game Com.	Oct. 13	Klamath River	200,000
Fish and Game Com.	Nov. 2	Sullaway Creek, tributary to Sacramento River	2,000,000
Fish and Game Com.	Nov. 2	Cold Creek, tributary to Sacramento River	2,970,000
Fish and Game Com.	Nov. 18	Klamath River	15,000
Fish and Game Com.	Nov. 19	Klamath River	15,000
		Total	30,295,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Silver Salmon.

Applicant	Date	Water stocked	Number
Fish and Game Com.	May 2	Klamath River	200,000
Fish and Game Com.	May 4	Klamath River	400,000
Fish and Game Com.	May 5	*Cold Creek, tributary to Sacramento River	746,000
		Total	1,346,000

*Silver Salmon planted in Cold Creek May 5 badly diseased; not considered worth hauling back to Klamath River.

Distribution of Black Spotted Trout.

Zick Abrams	Sept. 9	Abrams Lake	20,000

Distribution of Steelhead Trout.

R. P. Wilson	July 16	Deer Creek	6,000
Fish and Game Com.	July 18	Klamath River	350,000
McCloud River Lmbr. Co.	Aug. 9	McCloud River	27,500
McCloud River R. R. Co.	Aug. 9	McCloud River, east of Dry Creek	35,000
McCloud River R. R. Co.	Aug. 11	McCloud River, east of Dry Creek	37,500
McCloud River Lmbr. Co.	Aug. 11	McCloud River	25,000
Sisson Promotion Assn.	Aug. 12	Wagon Creek	80,000
Sisson Promotion Assn.	Aug. 12	Schoolhouse Creek	30,000
Sisson Promotion Assn.	Aug. 12	Spring Creek	50,000
Sisson Promotion Assn.	Aug. 12	Cold Creek	30,000
Sisson Promotion Assn.	Aug. 12	Sullaway Creek	60,000
Montague Gun Club	Aug. 25	Little Shasta Creek	16,000
Yreka Chamber of Com.	Aug. 25	Shasta River	20,000
F. O. Branstetter	Sept. 7	Sacramento River	10,000
		Total	727,000

Distribution of Loch Leven Trout.

B. Casalta	July 2	Wagon Creek	8,000
Sisson Promotion Club	July 2	Wagon Creek	10,000
Sisson Promotion Club	July 2	Spring Creek	15,000
Sisson Promotion Club	July 2	Sullaway Creek at Rupps	25,000
Robert Rupp	July 12	Sullaway Creek	15,000
McCloud River Lmbr. Co.	Aug. 9	McCloud River	22,000
McCloud River R. R. Co.	Aug. 9	McCloud River	22,000
W. L. Falkner	Aug. 25	Shasta River, headwaters	12,000
W. M. Bray	Aug. 25	Antelope Creek	5,000
O. E. Pile	Aug. 25	Butte Creek	5,000
Montague Gun Club	Aug. 25	Little Shasta Creek	4,000
Yreka Chamber of Com.	Aug. 25	Shasta River	16,000
Zick Abrams	Sept. 9	Abrams Lake	15,000
Dunsmuir Promotion Club	Aug. 29	Bear Creek	6,500
Dunsmuir Promotion Club	Aug. 29	Hedge Creek	4,500
Dunsmuir Promotion Club	Aug. 29	Soda Creek, Upper Branch	9,000
C. L. Lewis	Oct. 1	Cold Creek	35,000
Zick Abrams	Oct. 27	Abrams Lake	15,000
Sisson Promotion Club	Oct. 29	Cold Creek	5,000
		Total	249,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Eastern Brook Trout.

Applicant	Date	Water stocked	Number
B. Casalta	July 2	Wagon Creek	8,000
Sisson Promotion Club	July 2	Wagon Creek	6,000
Sisson Promotion Club	July 2	Spring Creek	4,000
Robert Rupp	July 12	Spring Creek	25,000
C. Lewis	July 15	Cold Creek	30,000
McCloud River R. R. Co.	Aug. 9	McCloud River, east of Dry Creek	14,000
McCloud River Lmbr. Co.	Aug. 9	McCloud River, east of Dry Creek	16,000
C. S. Erickson	Sept. 1	Bear Creek	6,000
		Total	109,000

Distribution of Rainbow Trout.

Sisson Promotion Club	July 2	Sullaway Creek	25,000
Sisson Promotion Club	July 2	Sullaway Creek at Rupps	35,000
R. P. Wilson	July 16	Deer Creek	20,000
McCloud River Lmbr. Co.	Aug. 9	McCloud River	24,000
McCloud River. R. R. Co.	Aug. 9	McCloud River, east of Dry Creek	26,000
McCloud River R. R. Co.	Aug. 11	McCloud River, east of Dry Creek	24,000
McCloud River Lmbr. Co.	Aug. 11	McCloud River	26,000
Mrs. R. C. Ney	Aug. 21	Little Shasta Creek	8,000
J. A. Carton	Aug. 25	Shasta River	12,000
W. M. Bray	Aug. 25	Antelope Creek	18,000
O. E. Pile	Aug. 25	Butte Creek	9,000
Montague Gun Club	Aug. 25	Little Shasta Creek	10,000
C. S. Erickson	Sept. 1	Bear Creek	6,000
Silas Nicholson	Sept. 1	Bear Creek	8,000
F. O. Branstetter	Sept. 7	Sacramento River	15,000
Zick Abrams	Sept. 9	Abrams Lake	25,000
Dunsmuir Promotion Club	Aug. 29	Bear Creek	6,500
Dunsmuir Promotion Club	Aug. 29	Hedge Creek	6,500
Dunsmuir Promotion Club	Aug. 29	Soda Creek, Upper Branch	7,000
C. Lewis	Oct. 1	Cold Creek	40,000
Zick Abrams	Oct. 27	Abrams Lake	15,000
		Total	366,000

SOLANO COUNTY.

Distribution of Steelhead Trout.

Winters Fish and Game Protective Association	July 21	Miller Creek	45,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

SONOMA COUNTY.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
H. S. Gutermute	Aug. 6	Mark West Creek	20,000
W. R. Stearns	Sept. 27	Sonoma Creek	30,000
J. W. Wise	Sept. 27	Adobe Canyon	10,000
J. W. Wise	Sept. 27	Nuns Creek	10,000
J. W. Wise	Sept. 27	Johnson Creek	10,000
F. D. Trosper	Oct. 12	Austin Creek	35,000
F. D. Trosper	Oct. 12	Ward Creek	5,000
F. D. Trosper	Oct. 12	Bear Pen Creek	10,000
A. H. Richardson	Oct. 12	Stewart's Point Creek	20,000
A. H. Richardson	Oct. 12	Fort Ross Creek	5,000
H. C. McCaughey	Oct. 18	Salmon Creek	25,000
		Total	180,000

Distribution of Rainbow Trout.

H. S. Gutermute	Oct. 12	Mark West Creek	6,000

TEHAMA COUNTY.

Distribution of Steelhead Trout.

C. W. De Long	July 8	Mill Creek	9,000
J. A. Owen	July 8	South Fork of Cottonwood Creek	12,000
U. S. Forestry Service	Aug. 21	Battle Creek at Lower Bridge	5,000
U. S. Forestry Service	Aug. 21	Martin Creek at Mineral Co	5,000
U. S. Forestry Service	Aug. 21	Battle Creek at Upper Bridge	10,000
A. B. McCollum	Aug. 21	Deer Creek	7,500
		Total	48,500

Distribution of Loch Leven Trout.

W. E. Hamlin	July 8	Mill Creek	12,500
Walter Stoll	Aug. 14	Elder Creek	6,000
H. H. Zimmerman	Aug. 28	Mill Creek	4,000
		Total	22,500

Distribution of Eastern Brook Trout.

Geo. Neale	Aug. 21	Mill Creek	6,000
Geo. Neale	Aug. 21	Battle Creek	6,000
H. H. Zimmerman	Aug. 28	Mill Creek	4,000
		Total	16,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
C. W. De Long	July 8	Mill Creek	5,000
J. A. Owen	July 8	South Fork of Cottonwood Creek	5,000
Casper Ehorn	July 8	Maple Creek	2,500
Walter Stoll	Aug. 14	Elder Creek	4,000
A. B. McCollum	Aug. 21	Deer Creek	5,000
H. H. Zimmerman	Aug. 28	Mill Creek	4,000
E. C. Powell	Aug. 28	Antelope Creek	14,000
Andrew Shafer	Sept. 8	Upper Antelope Creek	20,000
		Total	59,500

TRINITY COUNTY.

Distribution of Rainbow Trout.

C. E. Carr	Oct. 11	Trinity River	8,000

TULARE COUNTY.

Distribution of Steelhead Trout.

Porterville Fish and Game Association	Sept. 8	South Tule River	10,000
Tule River Fishing and Shooting Association	Sept. 8	Tule River	16,000
Deer Creek Fish and Game Protective Association	Sept. 8	Tyler Creek	8,000
Deer Creek Fish and Game Protective Association	Sept. 8	Deer Creek	8,000
C. A. Kirkpatrick	Sept. 8	Tule River	8,000
Ed Cramer	Sept. 8	White River	3,000
Ed Cramer	Sept. 8	Upper Peale River	3,000
H. M. Berry	Sept. 3	Posey Creek	6,000
		Total	62,000

Distribution of Loch Leven Trout.

Porterville Fish and Game Association	Sept. 8	Kissing Creek	4,000
Deer Creek Fish and Game Protective Association	Sept. 8	Tyler Creek	5,000
Deer Creek Fish and Game Protective Association	Sept. 8	Deer Creek	5,000
Ed Cramer	Sept. 8	White River	3,000
Ed Cramer	Sept. 8	Upper Peale River	3,000
H. M. Berry	Sept. 8	Posey Creek	6,000
		Total	26,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
Porterville Fish and Game Association	Sept. 3	South Tule River	9,000
Porterville Fish and Game Association	Sept. 3	Kissing Creek	11,000
Tule River Fishing and Shooting Association	Sept. 3	Tule River	18,000
Deer Creek Fish and Game Protective Association	Sept. 3	Deer Creek	5,000
Deer Creek Fish and Game Protective Association	Sept. 3	Tyler Creek	5,000
O. A. Kirkpatrick	Sept. 3	Tule River	8,000
		Total	56,000

TUOLUMNE COUNTY.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
Lewis Elliott	Sept. 9	Stanislaus River	10,000
Sierra & S. F. Power Co.	Sept. 9	Indian Creek	7,000
Geo. F. Conlin	Sept. 9	Stanislaus River, south fork	12,000
Board of Supervisors, Tuolumne County	Sept. 9	Tuolumne River, south fork	12,000
Board of Supervisors, Tuolumne County	Sept. 9	Tuolumne River, north fork	8,000
Board of Supervisors, Tuolumne County	Sept. 14	Tuolumne River, north fork	10,000
Board of Supervisors, Tuolumne County	Sept. 14	Sullivans Creek	12,000
Board of Supervisors, Tuolumne County	Sept. 14	Stanislaus River, main waters	4,000
		Total	75,000

Distribution of Black Spotted Trout.

Applicant	Date	Water stocked	Number
Lewis Elliott	Sept. 9	Stanislaus River	3,000
Lewis Elliott	Sept. 9	Rose Creek	3,000
Sierra & S. F. Power Co.	Sept. 9	Stanislaus River, at power house	15,000
		Total	21,000

Distribution of Loch Leven Trout.

Applicant	Date	Water stocked	Number
Lewis Elliott	Sept. 9	Stanislaus River	4,000
Geo. F. Conlin	Sept. 9	Stanislaus River, south fork	4,000
Board of Supervisors, Tuolumne County	Sept. 9	Stanislaus River, main waters	10,000
Board of Supervisors, Tuolumne County	Sept. 9	Releaf Stream	20,000
		Total	38,[illegible]

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Eastern Brook Trout.

Applicant	Date	Water stocked	Number
Geo. F. Conlin	Sept. 9	Stanislaus River, south fork	4,000

Distribution of Rainbow Trout.

Lewis Elliott	Sept. 9	Main Fork of Stanislaus River	4,000
Sierra & S. F. Power Co.	Sept. 9	Forebay, Stanislaus River	15,000
Sierra & S. F. Power Co.	Sept. 9	Sand Bar Dam, Stanislaus River	15,000
Geo. F. Conlin	Sept. 9	Stanislaus River, south fork	8,000
Board of Supervisors, Tuolumne County	Sept. 9	Tuolumne River, south fork	20,000
Board of Supervisors, Tuolumne County	Sept. 9	Tuolumne River, north fork	16,000
Board of Supervisors, Tuolumne County	Sept. 14	Tuolumne River, north fork	6,000
Board of Supervisors, Tuolumne County	Sept. 14	Crow Creek	4,000
Board of Supervisors, Tuolumne County	Sept. 14	Stanislaus River, main waters	34,000
		Total	122,000

VENTURA COUNTY.

Distribution of Quinnat Salmon.

J. J. Barnett	Oct. 8	Ventura River	25,000

Distribution of Steelhead Trout.

Geo. Rissman	Oct. 7	Sisar Creek	4,000
G. C. Hollister	Oct. 8	Agua Blanca Creek	10,000
J. J. Barnett	Oct. 8	Ventura River	50,000
J. J. Barnett	Oct. 8	San Antonio Creek	25,000
J. J. Barnett	Oct. 8	Coyote Creek	25,000
J. J. Barnett	Oct. 8	Seesaw Creek	8,000
Elkins & Temple	Oct. 8	Hopper Creek	4,000
W. W. Wilcox	Oct. 8	North Fork of Matilya River	10,000
W. W. Wilcox	Oct. 8	North Fork of Matilya River	6,000
J. J. Barnett	Oct. 21	Ventura River	12,000
J. J. Barnett	Oct. 21	San Antonio Creek	48,000
H. I. Pritchard	Oct. 22	Sespe River	20,000
		Total	222,000

Distribution of Loch Leven Trout.

W. W. Laidley	Sept. 8	Seymore Creek	6,000
T. E. Klipstein	Oct. 5	Seymore Creek	4,000
		Total	10,000

SISSON HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

STATE OF NEVADA.

Distribution of Rainbow Trout.

Applicant	Date	Water stocked	Number
W. W. Laidley	Sept. 8	Seymore Creek	4,000
T. E. Klipstein	Oct. 5	Lockwood Creek	4,000
J. J. Barnett	Oct. 8	North Fork	2,000
J. J. Barnett	Oct. 8	Reyes Creek	2,000
W. W. Wilcox	Oct. 8	North Fork of Matilya River	2,000
		Total	14,000

Distribution of Silver Salmon Eggs.

Nevada State Fish Commission	Feb. 14	Planted in state of Nevada	100,000

STATE OF OREGON.

Distribution of Black Spotted Trout.

James Withycombe	July 2	Wallowa Lake in eastern Oregon	100,000

PONDS, SISSON HATCHERY.

Rainbow Trout, Retained in Ponds.

Fish and Game Com.	Oct. 20	Retained in ponds at Sisson Hatchery	180,000

TAHOE HATCHERY.

Fish Distribution by Counties. Season 1915.

ALPINE COUNTY.

Distribution of Black Spotted Trout.

Grant P. Merrill	Aug. 17	East Carson (Silver Creek)	6,000
Grant P. Merrill	Aug. 17	East Carson (Hot Spring Creek)	6,000
Grant P. Merrill	Aug. 17	West Carson (Woodford Canyon)	21,000
Grant P. Merrill	Aug. 17	West Carson (Hope Valley)	12,000
Grant P. Merrill	Aug. 17	West Carson (near Woodfords)	6,000
Chas. W. Tryon	Aug. 17	Silver Ring Creek	12,000
Chas. W. Tryon	Aug. 17	Wolf Creek	6,000
Chas. W. Tryon	Aug. 17	North Fork of Mokelumne River	6,000
		Total	75,000

TAHOE HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

EL DORADO COUNTY.

Distribution of Black Spotted Trout.

Applicant	Date	Water stocked	Number
Fish and Game Com.	June 23	Power House Ditch	40,000
Fish and Game Com.	June 26	Tallac Creek	100,000
Fish and Game Com.	June 26	Power House Ditch	50,000
Fish and Game Com.	June 27	Taylor Creek	100,000
Fish and Game Com.	June 28	Tallac Creek Slough	95,000
Fish and Game Com.	June 29	Tallac Creek Slough	100,000
Fish and Game Com.	June 29	Green Bay, Fallen Leaf Lake	100,000
Fish and Game Com.	June 29	Cascade Lake	100,000
Fish and Game Com.	June 30	Tallac Creek Slough	74,000
Fish and Game Com.	July 8	Taylor Creek	100,000
Fish and Game Com.	July 11	Tallac Creek	100,000
Fish and Game Com.	July 11	Cascade Lake	100,000
Glen Alpine Co.	July 12	Susie Lake	40,000
Glen Alpine Co.	July 13	Grass Lake	40,000
Glen Alpine Co.	July 14	Cascade Lake	96,000
Glen Alpine Co.	July 14	Half Moon Lake	40,000
Fish and Game Com.	July 15	Fallen Leaf Lake	50,000
Fish and Game Com.	July 15	Little Truckee River	50,000
Glen Alpine Co.	July 15	Gilmore Lake	40,000
Fish and Game Com.	July 16	Little Truckee River	100,000
Glen Alpine Co.	July 16	Susie Lake	20,000
Glen Alpine Co.	July 16	Grass Lake	20,000
Fish and Game Com.	July 17	Tallac Creek Slough	100,000
Al Tahoe Co.	July 18	Trout Creek	25,000
Fish and Game Com.	July 19	Little Truckee River	90,000
Fish and Game Com.	July 19	Taylor Creek	24,000
Fish and Game Com.	July 29	Meiggs Bay Creek	25,000
C. T. Bradley	Sept. 20	Emerald Bay	25,000
E. G. Schmiedel	Oct. 8	Rabbit Lake	12,000
		Total	1,856,000

NEVADA COUNTY.

Distribution of Black Spotted Trout.

James McIver	Aug. 31	Donner Creek	15,000
Truckee Chamber of Com.	Sept. 9	Donner Lake	25,000
Truckee Chamber of Com.	Sept. 10	Donner Lake	25,000
Truckee Chamber of Com.	Sept. 11	Donner Lake	25,000
E. J. Baldwin	Sept. 18	Donner Lake	30,000
E. F. Stewart	Sept. 23	West Lakes	15,000
H. N. Freeman	Sept. 24	Lakes on ridge above Lake Sterling	50,000
Joseph Gouling and John Sherrett	Sept. 24	Lake Sherrett	18,000
		Total	203,000

TAHOE HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

PLACER COUNTY.

Distribution of Black Spotted Trout.

Applicant	Date	Water stocked	Number
Fish and Game Com.	Aug. 27	Slim Jim Creek	50,000
Tahoe Vista Hotel Co.	Aug. 30	Griff Creek	25,000
Fish and Game Com.	Sept. 13	Lake Tahoe, near Island Park	30,000
Fish and Game Com.	Sept. 17	Lake Tahoe, near Island Park	50,000
Fish and Game Com.	Sept. 21	Machine Shop Creek	30,500
E. R. Rees	Sept. 23	Crystal Lake	12,000
Fish and Game Com.	Sept. 25	Burton Creek Slough	22,500
Fish and Game Com.	Sept. 28	Burton Creek Slough	25,000
Fish and Game Com.	Sept. 30	Lake Tahoe, near car barns	20,000
Fish and Game Com.	Oct. 1	Lake Tahoe, source of Truckee River	30,000
Fish and Game Com.	Oct. 4	Burton Creek Slough	20,000
Fish and Game Com.	Oct. 6	Blackwood Creek	30,000
Fish and Game Com.	Oct. 8	Ward Creek	35,000
Fish and Game Com.	Oct. 11	Tahoe Lake, Island Park Tules	25,000
Fish and Game Com.	Oct. 12	Ward Creek	25,000
H. N. Freeman	Oct. 12	Lake Stirling	20,000
Fish and Game Com.	Oct. 12	Slim Jim Creek	14,000
		Total	464,000

SIERRA COUNTY.

Distribution of Black Spotted Trout.

Webber Lake Club	Sept. 7	Webber Lake and Inlet	60,000

BROOKDALE HATCHERY.

Fish Distribution by Counties. Season 1915.

MONTEREY COUNTY.

Distribution of Steelhead Trout.

J. L. Roberts	July 7	Garrapatis Creek	3,000
J. L. Roberts	July 7	Mill Creek	3,000
J. L. Roberts	July 7	Serra Hill Creek	2,000
J. L. Roberts	July 7	Rocky Creek	2,000
J. L. Roberts	July 7	North Fork of Little River	5,000
J. L. Roberts	July 7	South Fork of Little River	5,000
J. L. Roberts	July 7	Big Sur River	10,000
A. H. Abbott	July 13	Arroyo Seco	30,000
J. L. Roberts	Aug. 5	Lower Carmel	45,000
J. L. Roberts	Aug. 7	Pola Colorado	3,000
J. L. Roberts	Aug. 7	Rocky Creek	3,000
J. L. Roberts	Aug. 7	Mill Creek	4,500
J. L. Roberts	Aug. 7	Little Sur River	12,000
J. L. Roberts	Aug. 7	Big Sur River	22,500
		Total	150,000

BROOKDALE HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

SANTA CLARA COUNTY.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
I. L. Koppel	July 15	Trout Creek	2,000
I. L. Koppel	July 15	Walble Creek	2,000
I. L. Koppel	July 15	Ysabel Creek	6,000
I. L. Koppel	July 15	Arroyo Honda	5,000
I. L. Koppel	July 17	Stevens Creek	15,000
I. L. Koppel	July 17	San Francisquito Creek	5,000
I. L. Koppel	July 19	Almaden and tributaries	15,000
I. L. Koppel	July 20	Saratoga and Quito	12,000
I. L. Koppel	July 20	Van Ness Creek	5,000
I. L. Koppel	July 20	Booker Creek	5,000
I. L. Koppel	July 21	Llagas and tributaries	22,000
I. L. Koppel	July 22	Lower Coyote	8,000
I. L. Koppel	July 22	Los Animas	6,000
I. L. Koppel	July 22	Packwood	3,000
I. L. Koppel	July 23	Laurel Creek	3,000
I. L. Koppel	July 24	Stevens Creek	7,000
I. L. Koppel	July 24	Borde Creek	5,000
I. L. Koppel	July 24	Right Fork	5,000
I. L. Koppel	July 24	Left Fork	5,000
I. L. Koppel	July 25	Silver Creek	2,000
I. L. Koppel	July 25	San Felipe	10,000
I. L. Koppel	July 25	Dry Creek	3,000
I. L. Koppel	July 26	Alum Rock and Penetentia	13,000
I. L. Koppel	July 26	Bonita	3,000
I. L. Koppel	July 26	Ysabel and Arroyo Honda	6,000
I. L. Koppel	July 27	Uvas	15,000
I. L. Koppel	July 27	Little Arthur	3,000
I. L. Koppel	July 29	Long Bridge Creek	6,000
I. L. Koppel	July 29	Sweigert Creek	4,500
I. L. Koppel	July 29	Little Uvas Creek	4,500
I. L. Koppel	July 29	Ayer's Creek, Sargent	3,000
I. L. Koppel	July 29	Coyote Creek, Gilroy Hot Springs Branch	4,000
I. L. Koppel	July 29	Murphy Creek and Bodfish	4,000
F. Marriott	July 25	Uvas Creek	10,000
Los Gatos Fish and Game Protective Association	July 11	Cavanaugh Creek	5,000
Los Gatos Fish and Game Protective Association	July 11	Lyndon Creek	3,000
Los Gatos Fish and Game Protective Association	July 11	Austin	3,000
Los Gatos Fish and Game Protective Association	July 11	Hooker	5,000
Los Gatos Fish and Game Protective Association	July 24	Guadalupe Creek	12,000
E. L. Coldron	July 21	Los Gatos Creek	10,000
		Total	265,000

SANTA CRUZ COUNTY.

Distribution of Silver Salmon.

Santa Cruz Co.	Mar. 21	San Lorenzo River	28,000
Santa Cruz Co.	April 11	Scott Creek	25,000
Santa Cruz Co.	April 12	San Lorenzo River	18,000
		Total	71,000

TAHOE HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
Santa Cruz Co.	May 20	Love Creek	10,000
Santa Cruz Co.	May 21	Upper San Lorenzo River	18,000
Santa Cruz Co.	May 22	Kings Creek	12,000
Santa Cruz Co.	May 22	Two Bar Creek	6,000
Santa Cruz Co.	May 23	Fall Creek	17,000
Santa Cruz Co.	May 23	Newell Creek	16,000
Santa Cruz Co.	May 24	Bear Creek	12,000
Santa Cruz Co.	May 24	Deer Creek	8,000
Santa Cruz Co.	May 25	Jamison Creek	8,000
Santa Cruz Co.	May 25	Boulder Creek	12,000
Santa Cruz Co.	May 25	Scotts Creek	10,000
Santa Cruz Co.	May 26	Wadell Creek	22,000
Santa Cruz Co.	May 26	Sempervirens	8,000
Santa Cruz Co.	May 27	Zayante No. 5	2,000
Santa Cruz Co.	May 27	Felton Reservoir Creek	2,000
Santa Cruz Co.	May 27	Bean Creek	8,000
Santa Cruz Co.	May 27	Granite Creek	6,000
Santa Cruz Co.	May 28	Lompico Creek	10,500
Santa Cruz Co.	May 28	Gold Gulch Creek	4,500
Santa Cruz Co.	May 29	Branciforte Creek	15,000
Santa Cruz Co.	May 29	Laurel Glenn Creek	10,000
Santa Cruz Co.	May 30	Big Creek	10,000
Santa Cruz Co.	May 30	Mill Creek	10,000
Santa Cruz Co.	June 2	Wilders Creek	5,000
Santa Cruz Co.	June 2	Majors Creek	3,000
Santa Cruz Co.	June 2	Santa Cruz City Reservoir	2,000
Santa Cruz Co.	June 4	Hubbard Gulch Creek	7,500
Santa Cruz Co.	June 4	Shingle Mill Creek	2,500
Santa Cruz Co.	June 4	Big Tree Creek	2,000
Santa Cruz Co.	June 6	Laguna Creek	18,000
Santa Cruz Co.	June 6	Lidell Creek	9,000
Santa Cruz Co.	June 6	Coja Creek	6,000
Santa Cruz Co.	June 8	Glenn Canyon Creek	4,500
Santa Cruz Co.	June 8	Branciforte Creek, west fork	7,500
Santa Cruz Co.	June 9	Tunnel Creek	4,000
Santa Cruz Co.	June 9	Soquel Creek, west fork	14,000
Santa Cruz Co.	June 10	Amaya Creek	8,000
Santa Cruz Co.	June 10	Hester Creek	8,000
Santa Cruz Co.	June 11	Bean Creek	10,000
Santa Cruz Co.	June 11	Zayante Creek	12,000
Santa Cruz Co.	June 13	Big Creek	7,000
Santa Cruz Co.	June 13	San Vincente Creek	18,000
Santa Cruz Co.	June 14	Big Creek	6,000
Santa Cruz Co.	June 14	Boyer Creek	9,000
Santa Cruz Co.	June 14	Mill Creek	6,000
Santa Cruz Co.	June 17	Shingle Mill Creek	10,000
Santa Cruz Co.	June 18	Eureka Canyon Creek	4,000
Santa Cruz Co.	June 18	Shingle Mill Creek	2,000
Santa Cruz Co.	June 18	Diablo Creek	6,000
William McGrath	June 18	Cassuly	6,000
Santa Cruz Co.	June 19	Brown Valley Creek	10,000
Santa Cruz Co.	June 21	Soquel Creek	12,000
Santa Cruz Co.	June 22	Brown Valley Creek	14,000
Santa Cruz Co.	June 23	Pescadero Creek	12,000
Santa Cruz Co.	June 25	Aptos Creek	10,000
Santa Cruz Co.	June 25	Valencia Creek	8,000
Santa Cruz Co.	July 21	Hester Creek	2,000
Fish and Game Com.	Aug. 2	Scotts Creek	45,000
Fish and Game Com.	Aug. 3	Scotts Creek	45,000
S. C. Marcus	Aug. 5	Soquel Creek	14,000
S. C. Marcus	Aug. 5	Diablo Creek	2,000
Fish and Game Com.	Aug. 9	San Lorenzo River	47,000
		Total	655,000

BEAR VALLEY STATION.

Fish Distribution by Counties. Season 1915.

SAN BERNARDINO COUNTY.

Distribution of Black Spotted Trout.

Applicant	Date	Water stocked	Number
Fish and Game Com.	July 13	Bear Lake, Big	120,000
Fish and Game Com.	July 20	Bear Lake, Big	120,000
		Total	240,000

Distribution of Rainbow Trout.

Fish and Game Com.	July 8	Grays Meadows	3,000
Fish and Game Com.	July 8	Deer Creek	9,000
Fish and Game Com.	July 8	Upper Santa Ana	21,000
Fish and Game Com.	July 9	Bear Creek, below the dam	50,000
Fish and Game Com.	July 10	Bear Creek, below the dam	10,000
Fish and Game Com.	July 10	Deer Creek	30,000
Fish and Game Com.	July 11	Bear Lake	10,000
Fish and Game Com.	July 11	Huston Creek	25,000
Fish and Game Com.	July 11	Seeley Creek	5,000
Fish and Game Com.	July 11	Dark Canyon	10,000
Fish and Game Com.	July 13	Bear Lake, Big	120,000
Fish and Game Com.	July 20	Bear Lake, Big	120,000
		Total	413,000

PRICE CREEK HATCHERY.

Fish Distribution by Counties. Season 1915.

HUMBOLDT COUNTY.

Distribution of Quinnat Salmon.

Arcata Chamber of Com.	Mar. 31	Mad River	70,000
Humboldt Chamber Com.	April 1	Freshwater	70,000
Arcata Chamber of Com.	April 3	Mad River	70,000
Eureka Chamber of Com.	April 4	Jacoby Creek	70,000
Fish and Game Com.	April 5	Price Creek	300,000
Eureka Chamber of Com.	April 6	Elk River	70,000
Arcata Chamber of Com.	April 7	Mad River	70,000
Eureka Chamber of Com.	April 8	Elk River	70,000
Fish and Game Com.	April 8	Price Creek	200,000
Arcata Chamber of Com.	April 9	Mad River	70,000
Fish and Game Com.	April 9	Price Creek	143,500
Humboldt Chamber Com.	April 10	Freshwater	70,000
Arcata Chamber of Com.	April 12	Mad River	70,000
Humboldt Chamber Com.	April 13	Jacoby Creek	70,000
Humboldt Chamber Com.	April 14	Elk River	70,000
Fish and Game Com.	April 15	Eel River	100,000
Fish and Game Com.	April 15	Price Creek	50,000
Fish and Game Com.	April 16	Eel River	250,000
Fish and Game Com.	April 16	Price Creek	50,000
Fish and Game Com.	April 17	Eel River	250,000
Fish and Game Com.	April 17	Price Creek	50,000
Fish and Game Com.	April 18	Eel River	250,000
Fish and Game Com.	April 18	Price Creek	50,000
Fish and Game Com.	April 19	Price Creek	200,000
Fish and Game Com.	April 20	Price Creek	234,650
		Total	2,968,150

PRICE CREEK HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
Humboldt Chamber Com.	April 1	Jacoby Creek	70,000
Eureka Chamber of Com.	April 3	Elk River	30,000
Eureka Chamber of Com.	April 4	Elk River, South Fork and Little South Fork	40,000
Fish and Game Com.	April 5	Freshwater	70,000
Eureka Chamber of Com.	April 6	Elk River	70,000
Arcata Chamber of Com.	April 7	Freshwater	70,000
Eureka Chamber of Com.	April 8	Elk River	70,000
Fish and Game Com.	April 8	Mad River	70,000
Arcata Chamber of Com.	April 9	Mad River	70,000
Fish and Game Com.	April 9	Maple Creek	70,000
Humboldt Chamber Com.	April 10	Huntly Creek	70,000
Arcata Chamber of Com.	April 12	Redwood Creek	70,000
Humboldt Chamber Com.	April 13	Price Creek	27,000
Humboldt Chamber Com.	April 14	Howe Creek	50,000
		Total	847,000

UKIAH HATCHERY.

LAKE COUNTY.

Distribution of Steelhead Trout.

Mountain Imp. Club	June 30	Cold Creek	15,000
Mountain Imp. Club	July 7	Cold Creek and tributaries	15,000
Fish and Game Com.	July 29	Little Sulphur Creek	25,000
J. B. Robinson	July 31	Clover Creek	30,000
		Total	85,000

MENDOCINO COUNTY.

Distribution of Steelhead Trout.

B. M. Bucknell	June 13	Robinson Creek	30,000
Fish and Game Com.	June 14	Jack Smith Creek	40,000
W. A. Graham	June 15	Walker Creek	20,000
Fish and Game Com.	June 16	Russian River (below mouth of Cold Creek)	25,000
Bob Jones	June 16	Vichy Creek	25,000
Fish and Game Com.	June 17	Cold Creek	25,000
Fish and Game Com.	June 22	Orr Creek	30,000
Mendocino State Hospital	June 22	Mill Creek	20,000
J. W. Harris	June 29	Feliz Creek	25,000
Fish and Game Com.	June 30	Seward Creek	30,000
Fish and Game Com.	July 1	Reeves Canyon Creek	30,000
Fish and Game Com.	July 2	Ackerman Creek	25,000
J. W. Harris	July 3	Cummiskey Creek	8,000
J. W. Harris	July 3	Vassar Creek	17,000
Fish and Game Com.	July 12	Walker Valley Creek	35,000
Mendocino State Hospital	July 13	Mill Creek, south	15,000
Fish and Game Com.	July 15	Big River (Orrs Hot Springs)	35,000
Fish and Game Com.	July 16	Redwood Valley Creek	30,000
W. A. Graham	July 16	Walker Creek	15,000
F. W. Harmon	July 17	Sherwood Creek	15,000
C. E. Black	July 23	Woodman Creek	12,000
		Total	507,000

UKIAH HATCHERY—Continued.

Fish Distribution by Counties. Season 1915.

SONOMA COUNTY.

Distribution of Steelhead Trout.

Applicant	Date	Water stocked	Number
J. A. McMinn	June 23	Little Sulphur	20,000
J. A. McMinn	June 23	Warm Spring	26,000
J. A. McMinn	June 23	Mill Creek	24,000
J. M. Alexander	July 7	Mill Creek	17,500
J. M. Alexander	July 7	Warm Spring	17,500
J. M. Alexander	July 7	Little Sulphur	15,000
Fish and Game Com.	July 21	Sulphur Creek	40,000
Fish and Game Com.	July 27	Sulphur Creek	24,000
		Total	184,000

SNOW MOUNTAIN STATION.

LAKE COUNTY.

Distribution of Steelhead Trout.

Fish and Game Com.	June 19	Soda Creek	10,000
Fish and Game Com.	June 19	Panther Creek	10,000
		Total	20,000

MENDOCINO COUNTY.

Distribution of Steelhead Trout.

Fish and Game Com.	June 6	Whitney Creek (above fourth falls)	12,000
Fish and Game Com.	June 17	Whitney Creek	85,000
Fish and Game Com.	June 18	Trout Creek (two miles above dam)	40,000
Fish and Game Com.	June 18	Eel River (above fork from Snow Mountain)	75,000
Sam Holms	June 18	Mill Creek	50,000
Fish and Game Com.	June 20	Whitney Creek	50,000
Fish and Game Com.	June 20	Russian River (near power plant)	80,000
		Total	292,000

Summary of the Number of Fish Eggs Taken and the Number of Fry Which Will be Available for Distribution During the Season 1916.

Species	Eggs	Estimated loss	Shipped to other stations	Estimated number available for distribution	Estimated total available for distribution
Sisson Hatchery.					
Rainbow trout	2,227,740	287,740		1,940,000	
Eastern brook trout	2,227,000	155,000		2,072,000	
Loch Leven trout	1,839,000	109,000	125,000	1,605,000	
Black spotted trout	975,000	25,000		950,000	
Steelhead trout	3,036,000	95,000		2,941,000	
German brown trout	100,000	11,000		89,000	
					9,597,000
Quinnat salmon	18,398,340	398,340		18,000,000	18,000,000
Total					27,597,000
Tahoe Hatcheries.					
Black spotted trout	4,102,700	217,700	1,116,000	2,769,000	
Rainbow trout	240,000	25,000		215,000	
					2,984,000
Fort Seward Hatchery.					
Steelhead trout	1,002,000	77,000		925,000	
Black spotted trout	141,000	8,000		133,000	
Rainbow trout	105,000	10,000		95,000	
					1,153,000
Brookdale Hatchery.					
Steelhead trout	1,994,000	439,000	678,000		877,000
Ukiah Hatchery.					
Steelhead trout	556,000	111,000		445,000	445,000
Quinnat salmon	1,000,000	44,000		956,000	956,000
Snow Mountain Station.					
Steelhead trout	4,642,000	543,000	3,915,000	184,000	184,000
Bear Valley Hatchery.					
Rainbow trout	1,286,000	536,000		750,000	750,000
Almanor Hatchery.					
Rainbow trout	1,635,000	148,212	1,285,000	201,788	201,788
Marlett Lake-Carson Hatchery.					
Eastern brook trout	694,000	57,000	527,000	110,000	110,000
Total trout					16,301,788
Total salmon					18,956,000

STATE GAME FARM, HAYWARD.

Distribution, Sale, Liberation, etc., of Game Birds. July 1, 1914, to June 30,

Date	Applicant	Address	Pheasants	Quail
July 1, 1914	P. Verzic	Hayward, Alameda County	2	
Aug. 28, 1914	Mrs. M. Stephens	Alameda, Alameda County	2	
Aug. 31, 1914	A. H. Hesse	Mt. Eden, Alameda County	2	
Jan. 6, 1915	John Penke	Mt. Eden, Alameda County	2	
Jan. 7, 1915	Mrs. D. Gansberger	San Lorenzo, Alameda County	2	
Jan. 12, 1915	Jacob Harder, Jr.	Hayward, Alameda County	5	
Jan. 27, 1915	Miss C. Pestdorf	Hayward, Alameda County	1	
Feb. 10, 1915	R. H. Heger	Oakland, Alameda County	1	
Feb. 28, 1915	John Penke	Mt. Eden, Alameda County	2	
Mar. 5, 1915	Jacob Harder, Jr.	Hayward, Alameda County	1	
Mar. 9, 1915	Mr. Stevens	Alameda, Alameda County	2	
Mar. 10, 1915	A. H. Hesse	Mt. Eden, Alameda County	1	
Mar. 11, 1915	C. R. King	Hayward, Alameda County	1	
April 11, 1915	A. Vanderbilt	Oakland, Alameda County	1	
May 17, 1915	A. H. Hesse	Mt. Eden, Alameda County	1	
May 18, 1915	Jos. Sanders	Oakland, Alameda County	*15	
May 23, 1915	Percy Oliveira	San Lorenzo, Alameda County	*12	
July 29, 1915	M. Curtiss	Oakland, Alameda County	------	12
Aug. 2, 1915	E. W. Gifford	Oakland, Alameda County	------	------
Oct. 11, 1915	Peoples Water Co.	Oakland, Alameda County	50	
Nov. 28, 1915	Peter M Verzic	Hayward, Alameda County	2	
Dec. 23, 1915	A. H. Hesse	Mt. Eden, Alameda County	1	
Feb. 9, 1916	Bert L. Curtiss	Oakland, Alameda County	1	
Mar. 12, 1916	Bert L. Curtiss	Oakland, Alameda County	1	
Mar. 11, 1916	Dr. J. A. Plunkett	Oakland, Alameda County	------	1
Mar. 18, 1916	J. I. Sedgley	Alameda, Alameda County	8	
Mar. 24, 1916	Jacob Harder, Jr.	Hayward, Alameda County	12	
Mar. 25, 1916	Dr. C. J. Schilling	Oakland, Alameda County	1	
Mar. 25, 1916	Heger & Harris	Oakland, Alameda County	2	
April 8, 1916	Arthur Manter	Hayward, Alameda County	2	
May 15, 1916	Dr. C. J. Schilling	Oakland, Alameda County	------	1
Feb. 8, 1915	Chas. R. Wells	Fourth Crossing, Calaveras County	1	
Oct. 21, 1915	A. V. Lisenby	Fresno, Fresno County	1	
Nov. 9, 1915	A. D. Ferguson	Fresno, Fresno County	25	
April 25, 1916	A. H. Brown	Fresno, Fresno County	2	
Mar. 1, 1915	C. W. Kellogg	Bakersfield, Kern County	------	1
Mar. 18, 1915	S. K. Tevis	Bakersfield, Kern County	6	
Mar. 29, 1915	T. C. Dodge	Bakersfield, Kern County	2	
Aug. 30, 1915	E. W. Smalley	Hanford, Kings County	4	
Mar. 17, 1916	W. H. Roberts	Seigler Springs, Lake County	8	
Aug. 11, 1914	A. G. Wild	Los Angeles, Los Angeles County	2	
Aug. 28, 1914	A. G. Wild	Los Angeles, Los Angeles County	3	
Oct. 14, 1915	J. B. Lampman	Pasadena, Los Angeles County	------	1
Feb. 14, 1916	S. A. Denker	Los Angeles, Los Angeles County	8	
Mar. 2, 1916	S. M. Morgan	Los Angeles, Los Angeles County	2	
Mar. 20, 1916	J. B. Lampman	Pasadena, Los Angeles County	1	
May 1, 1916	S. A. Denker	Los Angeles, Los Angeles County	1	
Dec. 1, 1915	Madera County Park	Madera, Madera County	2	
Aug. 8, 1915	A. J. Molera	Monterey, Monterey County	50	
Aug. 16, 1915	P. H. Oyer	Pacific Grove, Monterey County	25	
Nov. 10, 1915	P. H. Oyer	Pacific Grove, Monterey County	1	
Nov. 15, 1915	J. H. Hill	Watsonville, Monterey County	30	
Mar. 2, 1915	F. W. Kiesel	Sacramento, Sacramento County	12	
July 12, 1915	F. W. Kiesel	Sacramento, Sacramento County	100	
July 30, 1915	Geo. Thisby	Walnut Grove, Sacramento County	25	
Aug. 12, 1915	State Agr. Society	Sacramento, Sacramento County	6	
Aug. 27, 1915	State Agr. Society	Sacramento, Sacramento County	------	6
Dec. 27, 1915	F. W. Kiesel	Sacramento, Sacramento County	10	
Mar. 22, 1916	Jack Hinters	Sacramento, Sacramento County	1	
Jan. 25, 1915	Tom Hawkins	Hollister, San Benito County	5	
Mar. 15, 1916	Jas. N. Colomb	San Francisco (liberated in San Benito County)	10	

STATE GAME FARM, HAYWARD—Continued.

Distribution, Sale, Liberation, etc., of Game Birds. July 1, 1914, to June 30, 1916.

Date	Applicant	Address	Pheasants	Quail	Miscellaneous
Mar. 29, 1916	Paicines Ranch Co.	Paicines, San Benito County	77		
April 9, 1915	J. Kappler	San Francisco		1	
Aug. 18, 1915	Dr. Stephen Piper	San Francisco		1	
Oct. 8, 1915	U. S. Naval Station	Goat Island, San Francisco County	22		
Oct. 22, 1915	Federal Laboratory	San Francisco		12	
Feb. 25, 1916	Chas. F. Breidenstein	San Francisco			3
April	Theo. Kytka	San Francisco			1
Oct. 31, 1914	J. P. Andrews	San Luis Obispo, San Luis Obispo Co.	12		
Dec. 8, 1914	J. P. Andrews	San Luis Obispo, San Luis Obispo Co.	4		
Jan. 2, 1915	Wm. Hagedorn	Menlo Park, San Mateo County	4		
Feb. 10, 1915	Wm. Hagedorn	Menlo Park, San Mateo County	1		5
Aug. 20, 1915	Herbert S. Rothchild	San Mateo, San Mateo County	2		
Dec. 9, 1914	H. M. Noble	San Jose, Santa Clara County	1		
Dec. 22, 1914	Geo. Dellwigg	San Jose, Santa Clara County		1	
Feb. 26, 1915	G. E. Rea	Gilroy, Santa Clara County	2		
Nov. 10, 1915	I. L. Koppel	San Jose, Santa Clara County	40		
Oct. 13, 1914	H. A. Hyde	Watsonville, Santa Cruz County	2		
Jan. 11, 1915	H. A. Hyde	Watsonville, Santa Cruz County	1		
April 17, 1916	A. J. Nakken	Santa Cruz, Santa Cruz County	2		
Oct. 18, 1915	F. G. Baum	Cassel, Shasta County	36		
Nov. 15, 1915	J. W. Long	Baird, Shasta County	12		
Aug. 29, 1915	Fish and Game Com.	Liberated in Siskiyou County	100		
Mar. 18, 1915	Gene M. Simpson	Corvallis, Oregon	12		
Dec. 6, 1915	S. Thurston Ballard	Louisville, Kentucky		12	
Dec. 20, 1915	Wm. J. Mackensen	Yardley, Pennsylvania			6
Jan. 28, 1916	Wm. J. Mackensen	Yardley, Pennsylvania		24	
Mar. 27, 1916	F. B. Stewart	Paradise Valley, Nevada	8		
		Totals	777 *27	73	16

*Eggs.

Statement of Lion Bounties Paid by Fish and Game Commission, from October, 1907, to June 30, 1916.

Counties	1907	1908	1909	1910	1911	1912	1913	1914	1915	January 1 to June 30, 1916	Total
Alameda	------	1	------	------	------	------	------	------	------	1	2
Alpine	------	------	------	------	------	------	------	------	1	------	1
Amador	------	3	------	1	2	2	------	------	------	------	8
Butte	2	11	5	2	4	3	2	1	------	------	30
Calaveras	------	1	4	1	------	1	------	1	3	------	11
Colusa	------	3	------	3	3	1	1	2	1	------	14
Del Norte	------	10	12	4	11	11	23	4	2	3	80
Eldorado	2	7	2	1	8	9	6	1	------	1	37
Fresno	------	1	3	1	------	4	------	1	1	------	11
Glenn	------	13	6	6	1	4	5	1	------	------	36
Humboldt	10	113	67	71	42	50	41	46	26	27	493
Imperial	------	------	------	------	------	------	------	------	1	------	1
Inyo	------	------	------	------	------	1	------	1	3	1	6
Kern	------	8	10	12	5	9	10	5	15	7	81
Lake	2	14	11	13	9	10	7	5	8	1	80
Lassen	------	------	1	------	2	1	2	------	------	------	6
Los Angeles	------	7	1	2	2	------	2	5	5	------	24
Madera	------	3	5	1	------	1	1	9	10	------	30
Mariposa	2	4	3	6	2	1	4	9	2	13	46
Mendocino	5	44	18	11	16	17	24	15	7	7	164
Merced	------	------	------	1	------	------	------	------	------	------	1
Modoc	------	------	1	1	1	------	------	------	------	------	3
Monterey	------	14	11	7	1	3	9	3	8	4	60
Mono	------	------	------	------	------	------	------	2	------	5	7
Napa	------	------	------	1	------	2	------	------	------	------	3
Nevada	------	1	1	1	------	------	------	------	------	2	5
Orange	------	------	1	1	1	------	1	------	------	------	4
Placer	------	5	4	1	2	7	3	3	1	3	29
Plumas	------	2	------	3	------	1	2	------	------	------	8
Riverside	------	2	5	------	------	4	2	------	------	1	14
San Benito	------	1	2	1	2	11	3	2	2	3	27
San Bernardino	------	5	2	1	2	------	2	1	1	------	14
San Diego	------	3	5	5	8	3	1	2	1	1	29
San Joaquin	------	------	------	------	------	------	------	------	2	------	2
San Luis Obispo	------	11	5	9	4	4	5	7	10	1	56
San Mateo	------	------	------	1	------	------	------	------	------	------	1
Santa Barbara	------	7	24	7	3	5	11	4	4	1	66
Santa Clara	------	------	4	------	------	1	1	1	1	2	10
Santa Cruz	------	------	------	1	------	------	------	------	------	------	1
Shasta	1	25	32	31	29	28	22	9	7	7	191
Sierra	------	1	------	------	------	3	2	------	------	------	6
Siskiyou	1	31	35	45	25	25	22	31	9	5	229
Sonoma	------	------	2	4	1	4	1	2	------	------	14
Stanislaus	------	------	2	------	1	------	------	------	1	------	4
Sutter	------	------	------	------	------	1	------	------	------	------	1
Tehama	3	31	19	25	10	22	27	5	4	------	146
Trinity	9	86	34	32	22	15	14	13	4	2	231
Tulare	------	6	8	11	4	5	3	10	8	5	60
Tuolumne	------	6	10	5	2	4	1	2	7	8	45
Ventura	------	1	6	4	6	2	------	1	7	------	27
Yuba	------	1	------	------	2	------	------	------	------	------	3
Totals	37	482	361	333	233	275	260	204	162	111	2,458

Total bounty paid, at $20 per scalp $49,160

Seizures of Fish, Game, and Illegally Used Fishing Apparatus, July 1, 1914, to June 30, 1916.

Ducks	6,695	
Rabbits, cottontail, hare	468	
Deer meat	3,802	pounds
Deer hides and horns	83	
Doves	122	
Quail	432	
Nongame birds	558	
Geese	1,265	
Shore birds	120	
Tree squirrels	9	
Antelope	55	pounds
Traps	8	
Miscellaneous game	60	
Sea otter skin	1	
Illegally used fishing apparatus, nets, lines, etc.*	337	
Trout	5,298	pounds
Striped bass	3,900	pounds
Salmon	4,196	pounds
Sturgeon	195	pounds
Black bass	271	pounds
Crabs	4,546	
Crawfish or lobsters	886	
Crawfish traps	8	
Clams	2,291	
Abalones	1,576	
Fish traps	8	
Shrimp and shrimp shells	5,041	pounds
Miscellaneous fish	2,231	pounds

Illegally used fishing apparatus, after condemnation in superior courts, is destroyed or sold by the board in accordance with law. All wholesome fish and game is donated to public and charitable institutions, from whom many grateful letters of acknowledgment have been received.

During the period from July 1, 1914, to June 30, 1916, there were 512 searches of markets, restaurants, private individuals, conveyances, etc., for illegal fish and game, made by deputies.

*337 nets, lines, etc., represent about 12,668 fathoms or 76,008 feet.

Summary of Prosecutions for Violations of State Game Laws, July 1, 1914, to June 30, 1916.

Offense	Number of arrests	Convicted	Acquitted and dismissed	Pending	Sentence suspended and probation	Number of days imprisonment	Fines imposed	Fines collected
Violations hunting license law	424	384	34	6	19	140	$6,335 00	$5,897 50
Deer—killing, pursuing, possession, close season; excess bag limit	150	112	30	8	3	513	3,355 00	3,072 00
Female deer and fawns—killing and possession	60	41	17	2	3	168	2,725 00	1,782 00
Spiked bucks—killing and possession	17	15	2	--------	1	200	650 00	450 00
Deer hides—female; evidence of sex removed; buying or selling (hides and meat); not exhibiting on request of officer (hides and horns)	27	23	3	1	1	180	814 00	749 00
Ducks—killing and possession, close season	30	22	8	--------	8	68	595 00	452 00
Ducks—excess bag limit	44	27	16	1	7	--------	615 00	610 00
Ducks—using a trained animal for taking; night shooting; shooting from power boat in motion	59	43	12	4	13	--------	835 00	755 00
Quail—killing and possession, close season	83	78	5	--------	1	45	2,115 00	1,920 00
Quail—excess bag limit; buying and selling	7	6	1	--------	1	--------	130 00	130 00
Doves—killing and possession, close season; excess bag limit	27	27	--------	--------	2	6	620 00	589 00
Snipe, curlew, rail, plover and other shore birds—killing, possession, close season; excess bag limit	33	33	--------	--------	1	--------	800 00	775 00
Pheasants, swans; killing	10	9	1	--------	--------	--------	240 00	240 00
Grouse, sage hen; killing and possession, close season; excess bag limit	12	12	--------	--------	--------	--------	300 00	275 00
Wild pigeons—killing and possession, close season	4	3	1	--------	1	3	50 00	47 00
Antelope—killing	1	--------	1	--------	--------	--------	--------	--------
Nongame birds—killing and possession	127	115	11	1	12	12½	1,501 50	1,380 50
Illegal trapping and possession of birds, without permit	6	6	--------	--------	1	--------	110 00	110 00
Illegal shipping of game—not properly marked; concealed package	3	--------	3	--------	--------	--------	--------	--------
Cottontail and bush rabbits—killing and possession, close season; excess bag limit	68	59	4	--------	13	25	1,085 00	910 00
Tree squirrels—killing and possession, close season	16	10	6	--------	1	--------	250 00	225 00
Wild geese—killing and possession, close season	1	1	--------	--------	--------	--------	25 00	25 00
Sea otter in possession	1	--------	1	--------	--------	--------	--------	--------
Total game cases	1,205	1,026	156	23	82	1,360½	$23,101 50	$20,394 00

Summary of Prosecutions for Violations of State Fish Laws, July 1, 1914, to June 30, 1916.

Offense	Number of arrests	Convicted	Acquitted and dismissed	Pending	Sentence suspended and probation	Number of days imprisonment	Fines imposed	Fines collected
Fishing (market) without a license	140	124	16		31	95	$1,480 00	$1,015 00
Fishing (angling) without a license	141	131	10		11	10	2,830 00	2,512 00
Wholesale dealing in fish without a license; not keeping a register of fish purchased	14	12	2		1		215 00	195 00
Illegal fishing apparatus (nets, lines, spears, etc.)	174	105	61	8	34	805	9,135 00	4,264 00
Salmon, catching or possession, close season; underweight for sale	7	7			4		370 00	70 00
Saturday and Sunday fishing with net for salmon, shad, or striped bass	8	8			1	180	335 00	35 00
Striped bass, close season; underweight; exporting	35	24	6	5	4	45	435 00	390 00
Black bass, close season; excess bag limit; undersized	9	5	4		2	250	120 00	20 00
Trout, close season, excess bag limit	100	93	5	2	7	10	1,929 00	1,559 00
Catfish, undersized, buying or selling	12	6	5	1	1	2	170 00	168 00
Sturgeon, undersized	4	4					80 00	80 00
Salt water perch, buying or selling	6	3	3				40 00	40 00
Taking fish within fifty feet of a fishway	1		1					
Using explosives to take fish	6	4	2			250	950 00	250 00
Polluting waters—oil, sawdust, etc.	6		4	2				
Failure to screen ditches when ordered	2	1	1				35 00	35 00
Young of fish, taking or possession	14	13	1		5		245 00	195 00
Taking shellfish in Monterey Fish Reservation	2	2			1		50 00	25 00
Crabs, close season; undersized; female	70	57	13		28	50	510 00	435 00
Clams, excess bag limit; undersized	35	35			4		400 00	340 00
Abalones, close season; undersized; other than for food purposes	61	55	3	3	7	20	1,105 00	875 00
Crawfish, close season; undersized and oversized	19	18	1			26	475 00	379 00
California dried shrimp and shells	16	14	2		7		140 00	140 00
Total fish cases	882	721	140	21	148	1,743	$21,049 00	$13,022 00
Total fish and game cases	2,087	1,747	296	44	280	3,108½	$44,150 50	$33,416 00

Recapitulation.

Arrests—			
Fish cases		882	
Game cases		1,205	
Total			2,087
Convictions—			
Fish cases	721		
Game cases	1,026		
		1,747	
Acquittals and dismissals—			
Fish cases	140		
Game cases	156		
		296	
Pending cases—			
Fish cases	21		
Game cases	23		
		44	
Total			2,087
Fines imposed—			
Fish cases	$21,049 00		
Game cases	23,101 50		
Total			$44,150 50
Fines collected—			
Fish cases	$13,022 00		
Game cases	20,394 00		
Total			$33,416 00
Number of days imprisonment—			
Fish cases	1,743		
Game cases	1,360½		
Total			3,103½

Total Arrests for a Period of Fourteen Years.

1902-1904	550
1904-1906	774
1906-1908	1,192
1908-1910	1,771
1910-1912	2,063
1912-1914	1,993
1914-1916	2,087
Total	10,430

Hunting and Angling License Sales.

	Angling January 1 to December 31		Hunting July 1 to June 30	
	1914	1915	1914-15	1915-16
Alameda	$2,895 00	$2,856 00	$8,183 00	$7,509 00
Alpine	198 00	158 00	60 00	56 00
Amador	520 00	690 00	1,647 00	1,569 00
Butte	2,219 00	2,026 00	2,828 00	2,462 00
Calaveras	748 00	906 00	1,559 00	1,450 00
Colusa	461 00	392 00	1,588 00	1,553 00
Contra Costa	616 00	524 00	2,257 00	2,117 00
Del Norte	72 00	187 00	323 00	506 00
Eldorado	1,051 00	1,218 00	1,488 00	1,431 00
Fresno	3,053 00	3,556 00	6,402 00	6,774 00
Glenn	294 00	287 00	1,017 00	1,016 00
Humboldt	3,232 00	3,086 00	3,907 00	3,517 00
Imperial	22 00	15 00	598 00	539 00
Inyo	1,576 00	1,553 00	1,154 00	1,189 00
Kern	1,270 00	1,262 00	5,251 00	5,068 00
Kings	459 00	715 00	1,335 00	1,549 00
Lake	342 00	344 00	1,316 00	1,155 00
Lassen	1,152 00	1,272 00	1,326 00	1,274 00
Los Angeles	10,318 00	11,259 00	22,212 00	19,489 00
Madera	496 00	501 00	1,019 00	*205 00
Marin	387 00	314 00	1,111 00	----------
Mariposa	111 00	73 00	269 00	264 00
Mendocino	2,098 00	1,803 00	3,451 00	*2,400 00
Merced	496 00	488 00	1,992 00	1,953 00
Modoc	476 00	574 00	943 00	1,038 00
Mono	413 00	402 00	225 00	221 00
Monterey	656 00	739 00	1,742 00	1,784 00
Napa	1,061 00	1,255 00	2,283 00	2,060 00
Nevada	1,442 00	1,526 00	1,694 00	1,535 00
Orange	1,007 00	970 00	2,879 00	2,692 00
Placer	1,571 00	1,568 00	2,055 00	2,435 00
Plumas	1,463 00	1,605 00	862 00	941 00
Riverside	665 00	944 00	3,225 00	3,158 00
Sacramento	2,616 00	2,199 00	5,546 00	3,075 00
San Benito	165 00	214 00	1,085 00	1,088 00
San Bernardino	2,166 00	3,196 00	3,820 00	3,177 00
San Diego	1,185 00	887 00	5,688 00	5,359 00
San Joaquin	1,758 00	1,927 00	4,240 00	3,969 00
San Luis Obispo	678 00	904 00	1,365 00	1,439 00
San Mateo	640 00	683 00	1,813 00	1,552 00
Santa Barbara	1,740 00	1,964 00	2,441 00	2,419 00
Santa Clara	2,460 00	3,339 00	4,747 00	4,807 00
Santa Cruz	2,052 00	2,004 00	2,541 00	1,690 00
Shasta	1,590 00	1,448 00	2,167 00	1,995 00
Sierra	523 00	478 00	331 00	306 00
Siskiyou	2,722 00	2,990 00	3,749 00	3,576 00
Solano	646 00	849 00	2,385 00	2,215 00
Sonoma	2,583 00	2,825 00	5,923 00	5,713 00
Stanislaus	1,140 00	1,273 00	1,807 00	2,195 00
Sutter	129 00	131 00	777 00	738 00
Tehama	581 00	589 00	1,397 00	1,335 00
Trinity	442 00	368 00	924 00	913 00
Tulare	2,050 00	2,468 00	3,378 00	3,862 00
Tuolumne	920 00	1,024 00	1,187 00	1,275 00
Ventura	1,373 00	1,547 00	1,972 00	2,184 00
Yolo	385 00	394 00	2,085 00	2,036 00
Yuba	448 00	437 00	1,233 00	1,128 00
San Francisco office	8,736 00	8,561 00	13,557 00	15,567 00
Los Angeles office	959 00	819 00	575 00	1,021 00
Sacramento office	291 00	537 00	580 00	2,443 00
Fresno office	599 00	547 00	742 00	911 00
Totals	$81,417 00	$89,620 00	$166,307 00	$158,930 00

*Account not closed.

FINANCIAL STATEMENT, FISCAL YEARS 1914-1915 and 1915-1916.

REVENUES AND DISBURSEMENTS.

Receipts for Fiscal Year 1914-1915.

June 30, 1914—Balance in state treasury		$9,885 70
Receipts.		
Sale of hunting licenses, 1913-1914	$6,056 00	
Sale of hunting licenses, 1914-1915	153,073 00	
		159,129 00
Sale of anglers' licenses, 1914	$71,521 00	
Sale of anglers' licenses, 1915	8,209 00	
		79,730 00
Sale of wholesale fish and game dealers' licenses, 1913-1914	$30 00	
Sale of wholesale fish and game dealers' licenses, 1914-1915	1,420 00	
		1,450 00
Sale of market fishing licenses, 1914-1915	$39,210 00	
Sale of market fishing licenses, 1915-1916	12,070 00	
		51,280 00
Sale of trout farm licenses		10 00
Sale of game farm products		415 03
Received from importers of crawfish for inspecting		902 97
Sundry sales, refunds, rebates, etc		253 28
Fines paid into state treasury for violations of fish, game and license laws		15,937 50
Total		$319,083 48
Less exchange and express charges paid state treasurer on remittances made by county clerks and justices of the peace		60 92
Total		$319,022 56

Receipts for Fiscal Year 1915-1916.

Sale of hunting licenses, 1914-1915	$13,517 00	
Sale of hunting licenses, 1915-1916	150,346 00	
		$163,863 00
Sale of anglers' licenses, 1914	$108 00	
Sale of anglers' licenses, 1915	81,474 00	
Sale of anglers' licenses, 1916	16,682 00	
		98,264 00
Sale of wholesale fish and game dealers' licenses, 1914-1915	$90 00	
Sale of wholesale fish and game dealers' licenses, 1915-1916	1,535 00	
		1,625 00
Sale of market fishing licenses, 1915-1916	$26,240 00	
Sale of market fishing licenses, 1916-1917	9,820 00	
		36,060 00
Sale of trout farm licenses		20 00
Sale of game farm products		182 50
Received from importers of crawfish for inspecting same		1,100 00
Received from importers of abalone for inspecting same		1,010 00
Sundry sales, refunds, rebates, etc		199 09
Fines paid into state treasury for violations of fish, game and license laws		18,187 00
Total		$320,510 59
Less exchange and express charges paid state treasurer on remittances made by county clerks and justices of the peace		48 20
Total		$320,462 39

Recapitulation.

Receipts for fiscal year, 1914-1915	$319,022 56	
Receipts for fiscal year, 1915-1916	320,462 39	
		$639,484 95
Disbursements, fiscal year 1914-1915	271,996 10	
Disbursements, fiscal year 1915-1916	320,808 19	
		592,804 29
July 1, 1916—Balance in state treasury		$46,680 66

Disbursements for Fiscal Year 1914-1915.

GENERAL ADMINISTRATION.

Commissioners' traveling and other expenses	$735 08	
Salaries of administrative assistants	12,081 50	
Traveling expenses of administrative assistants	832 24	
Rentals, office and other supplies	3,991 71	
		$17,640 48

GENERAL FISH AND GAME PATROL.

San Francisco Division.

Salaries of deputies and employees	$33,756 80	
Traveling expenses of deputies and employees	13,540 02	
Rentals, office and other supplies	2,200 11	
		49,496 93

Sacramento Division.

Salaries of deputies and employees	$29,355 31	
Traveling expenses of deputies and employees	14,196 77	
Rentals, office and other supplies	1,564 51	
		45,116 59

Los Angeles Division.

Salaries of deputies and employees	$12,870 67	
Traveling expenses of deputies and employees	3,954 94	
Rentals, office and other supplies	1,792 78	
		18,618 39

Fresno Division.

Salaries of deputies and employees	$12,843 84	
Traveling expenses of deputies and employees	6,439 12	
Rentals, office and other supplies	1,077 89	
		20,360 85

Miscellaneous Expenditures.

Prosecutions and allowances		4,398 12
General printing		2,058 13
Subtotal, general administration and patrol		$157,689 49
Cost general administration and game patrol (60 per cent)		$94,613 69
Cost general administration and fish patrol (40 per cent)		63,075 80
		$157,689 49

Fishery Expenditures.

Administration.

Salaries of superintendent of hatcheries and assistants	$3,967 82	
Traveling expenses of superintendent of hatcheries and assistants	1,512 99	
Office and other supplies	650 64	
		6,131 45

Fishery Research and Publicity.

Salaries	$3,610 30	
Traveling expenses	1,285 22	
Supplies and general expenses	1,366 95	
		6,262 47

Screen and Fishway Surveys.

Salaries	$2,620 34	
Traveling expenses	1,422 70	
Supplies and general expenses	26 51	
		4,069 55

Fish Transplanting (Pack Train, Messengers, etc.).

Salaries	$1,361 08	
Traveling expenses	2,717 22	
Supplies and general expenses	159 69	
		4,237 99

Fish Distribution Cars.

Salaries	$2,001 89	
Traveling expenses and mess allowance	1,158 40	
General expenses and supplies	1,118 67	
Repairs	959 21	
		5,238 17

Fish Patrol (Launches, etc.),

Salaries	$2,717 84	
Traveling expenses and mess allowance	713 31	
Repairs	552 43	
Supplies (oil, etc.) and general expenses	1,032 89	
		5,016 47

Sisson Hatchery.

Salaries	$17,996 18	
Traveling expenses	27 35	
Construction and repairs	2,788 74	
Fish food and ice for meat	4,628 97	
General expenses and supplies	1,084 07	
		26,525 31

Sisson Hatchery Auxiliary Stations.

Salaries	$2,177 37	
Traveling expenses	262 33	
Construction and repairs	425 68	
General expenses and supplies	186 88	
		3,052 26

Tahoe Hatcheries.

Salaries	$1,933 67	
Traveling expenses	167 70	
Construction and repairs	34 36	
General expenses and supplies	370 83	
		2,506 56

Price Creek Hatchery.

Salaries	$1,764 17	
Traveling expenses	154 55	
Construction and repairs	58 54	
General expenses and supplies	890 78	
		2,868 04

Ukiah and Snow Mountain Hatchery.

Salaries	$2,259 87	
Traveling expenses	167 89	
Construction and repairs	581 99	
General expenses and supplies	426 20	
		3,435 95

Wawona Hatchery.

Salaries	$120 00	
Traveling expenses	50 35	
Construction and repairs	---------	
General expenses and supplies	---------	
		170 35

Scott Creek and Brookdale Hatchery.

Salaries	$1,139 50	
Traveling expenses	7 50	
Construction and repairs	14 88	
General expenses and supplies	415 95	
		1,577 83

Bear Valley Hatchery.

Salaries	$602 66	
Traveling expenses	199 60	
Construction and repairs	---------	
General expenses and supplies	29 56	
		831 82

Miscellaneous Expenditures.

Printing and lithographing fishing licenses	630 26
Anglers' license commissions and refunds	8,573 65
Market fishing license commissions	692 25
Crawfish and abalone inspection	904 03
Subtotal, fishery expenditures	$82,724 41

Game Expenditures.

Hayward Game Farm.

Salaries	$2,566 00	
Traveling expenses	141 15	
Rent	450 00	
Construction and repairs	378 31	
Feed for birds	655 64	
General expenses and supplies	775 48	
		$4,966 53

Game Research and Publicity.

Salaries	$3,636 08	
Traveling expenses	678 22	
General expenses and supplies	3,026 37	
		7,340 67

Miscellaneous Expenditures.

Printing and lithographing of hunting licenses	$567 50
Hunting license commissions and refunds	15,287 50
Mountain lion bounties	3,420 00
Subtotal, game expenditures	$31,582 20
Grand total of all expenditures	$271,996 10

Segregation.

Total of fish expenditures	$145,800 21
Total of game expenditures	126,195 89
Total	$271,996 10

Disbursements for Fiscal Year 1915-1916.

GENERAL ADMINISTRATION.

Commissioners' traveling and other expenses	$740 91	
Salaries of administrative assistants	14,872 17	
Traveling expenses of administrative assistants	1,582 56	
Rentals, office and other supplies	4,847 05	
		$22,042 69

GENERAL FISH AND GAME PATROL.

San Francisco Division.

Salaries of deputies and employees	$39,653 85	
Traveling expenses of deputies and employees	18,390 03	
Rentals, office and other supplies	2,888 54	
		60,931 42

Sacramento Division.

Salaries of deputies and employees	$29,481 00	
Traveling expenses of deputies and employees	14,185 99	
Rentals, office and other supplies	1,757 47	
		45,424 46

Los Angeles Division.

Salaries of deputies and employees	$15,201 16	
Traveling expenses of deputies and employees	5,059 90	
Rentals, office and other supplies	2,079 29	
		22,340 35

Fresno Division.

Salaries of deputies and employees	$9,699 54	
Traveling expenses of deputies and employees	5,353 10	
Rentals, office and other supplies	794 74	
		$15,847 38

Miscellaneous Expenditures.

Prosecutions and allowances	2,995 08
General printing	6,488 03
Accident claims	3,632 27
Subtotal, general administration and patrol	$179,711 61
Cost general administration and game patrol (65 per cent)	$116,812 55
Cost general administration and fish patrol (35 per cent)	62,899 06
	$179,711 61

Special Fishery Expenditures.

Administration.

Salaries of superintendent of hatcheries and assistants	$4,890 67	
Traveling expenses of superintendent of hatcheries and assistants	1,681 99	
Office and other supplies	1,135 77	
		$7,708 43

Fishery Research and Publicity.

Salaries	$3,991 66	
Traveling expenses	662 05	
General expenses and supplies	1,053 31	
		5,707 02

Screen and Fishway Surveys.

Salaries	$2,799 00	
Traveling expenses	1,949 56	
General expenses and supplies	112 70	
		4,861 26

Fish Transplanting.

Salaries	$485 00	
Traveling expenses	866 95	
General expenses and supplies	45 81	
		1,397 76

Fish Distribution Cars.

Salaries	$2,473 92	
Traveling expenses and mess allowance	1,537 72	
Repairs	2,064 88	
General expenses and supplies	2,688 31	
		8,764 83

Special Fish Patrol (Launches, etc.).

Salaries	$4,247 02	
Traveling expenses and mess allowance	1,181 02	
Repairs	579 48	
Supplies (oil, etc.) and general expenses	1,868 16	
		7,875 68

Sisson Hatchery.

Salaries	$18,033 70	
Traveling expenses	132 70	
Construction and repairs	982 49	
Fish food and ice for meat	5,098 16	
General expenses and supplies	1,853 22	
		26,100 27

Sisson Hatchery Auxiliary Stations.

Salaries	$1,322 23	
Traveling expenses	55 00	
Construction and repairs	155 76	
General expenses and supplies	247 74	
		1,780 73

Tahoe Hatcheries.

Salaries	$2,369 67	
Traveling expenses	199 08	
Construction and repairs	67 72	
General expenses and supplies	589 18	
		3,225 65

Price Creek Hatchery.

Salaries	$43 10	
Traveling expenses	----------	
Construction and repairs	----------	
General expenses and supplies	1 45	
		44 55

Ukiah and Snow Mountain Hatchery.

Salaries	$2,426 50	
Traveling expenses	200 27	
Construction and repairs	101 20	
General expenses and supplies	757 53	
		3,485 50

Scott Creek and Brookdale Hatcheries.

Salaries	$1,782 80	
Traveling expenses	30 85	
Construction and repairs	6 70	
General expenses and supplies	590 15	
		$2,410 50

Inyo County Hatchery.

Construction	$12,993 94	
Equipment	6,916 39	
		19,910 33

Bear Valley Hatchery.

Salaries	$1,143 65	
Traveling expenses	299 40	
Construction and repairs	53 64	
General expenses and supplies	364 55	
		1,861 24

Marlett Lake and Carson Hatchery.

Salaries	$528 22	
Traveling expenses	----------	
Construction and repairs	2 50	
General expenses and supplies	272 37	
		803 09

Fort Seward Hatchery.

Salaries	$480 00	
Traveling expenses	9 30	
Construction	3,374 69	
General expenses and supplies	97 52	
		3,961 51

Almanor Station.

Salaries	$572 02	
Traveling expenses	53 50	
Construction and repairs	66 69	
General expenses and supplies	115 48	
		807 69

Miscellaneous Expenditures.

Printing and lithographing fishing licenses		562 22
Anglers' license commissions and refunds		9,299 40
Market fishing license commissions		778 00
Crawfish and abalone inspection		2,100 00
Subtotal, fishery expenditures		$113,445 66

Special Game Expenditures.

Hayward Game Farm.

Salaries	$2,254 50	
Traveling expenses	336 96	
Rent	412 50	
Construction and repairs	51 62	
Feed for birds	518 92	
General expenses and supplies	686 18	
		$4,260 68

Game Research and Publicity.

Salaries	$2,679 25	
Traveling expenses	221 85	
General expenses and supplies	785 08	
		3,686 18

Miscellaneous Expenditures.

Printing and lithographing of hunting licenses		805 60
Hunting license commissions and refunds		14,844 70
Mountain lion bounties		3,800 00
Winter game feeding		303 76
Subtotal, game expenditures		$27,650 92
Grand total of all expenditures		$320,808 19

Segregation.

Total of fish expenditures	$176,344 72
Total of game expenditures	144,463 47
Total	$320,808 19

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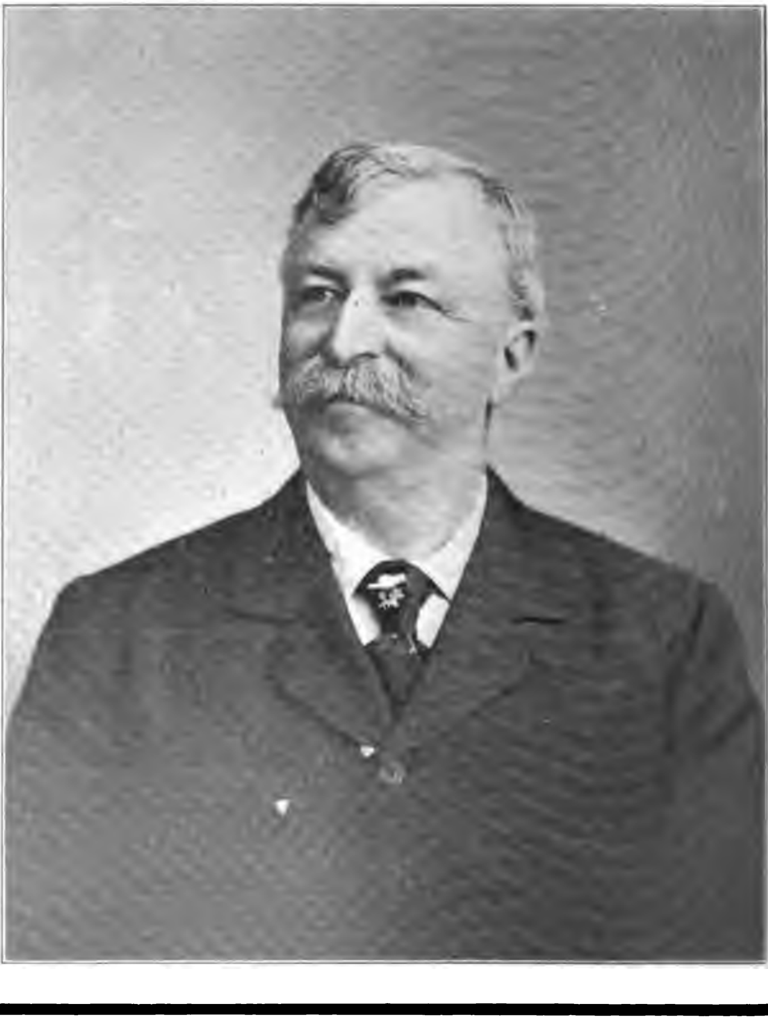
IN MEMORIAM



MANUEL L. CROSS

DEPUTY OF THE CALIFORNIA FISH AND GAME COMMISSION
FOR TWENTY YEARS

BORN IN PENNSYLVANIA, SEPTEMBER 4, 1842
DIED IN SACRAMENTO, CALIFORNIA, MAY 1, 1915
IN HIS SEVENTY-THIRD YEAR

CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

MANUEL L. CROSS, GAME WARDEN.

Written in appreciation of his sterling character and splendid service by his Chief, who learned of him.

Manuel L. Cross, for twenty years a warden in the service of the California Fish and Game Commission, died in Sacramento on the first day of May of this year. This testimonial from a fellow worker is a humble effort to place the man and his service to the State before the readers of this publication. It is hoped that his life and work may be the source of inspiration for more earnest effort and more faithful service to the men and women who will continue in the work he regretfully laid down.

Up to the last three years, "Mannie," as he was called by his host of intimate friends, enjoyed splendid health and was able to set the pace for any of his younger associates. Latterly, however, he was a constant but patient sufferer from the malady of the heart which finally caused his death. But even during his illness he was a hard and faithful worker, always up at daylight and through the fish markets and along the wharves where the fish come in before the average city man is out of bed. No task was ever too hard for him nor was any day too long. If the job had to be done, Cross was there to see it through and see it through right.

The very soul of honor himself, he had no use for untruthful or dishonest people, with whom his work often threw him, and woe betide the person who broke a promise to him or failed to keep an engagement. Although possessed of the kindest heart in the world, he could so speak his mind to a dilatory associate as to create a very lasting impression. It was always his work to help in the "breaking in" process and many of us have cause to be grateful for the training we gained under the old man.

While not a scholarly man in the accepted use of the term, Cross had a fine mind, stored with useful information, which he was able to use. Probably no man in the State had a better "practical" knowledge of fish and the methods of fishermen and fish dealers than he. It is interesting, too, that not a man among the hundreds he had arrested during his two decades of service bore a grudge against him or entertained other than the most respectful and friendly attitude toward him. With Cross, an arrest was merely the carrying out of his obligation, in which he believed religiously, and this spirit was bound to impress itself upon the offender. As an Italian fisherman told me once: "I don't like to be arrested; but I violate the law and Mr. Cross he can do nothing different but bring me in. He don't like to do it, because I tell him I very poor man with big family, but he say, 'Angelo, it is my duty and I can do nothing else.' And so I not get mad at him, for I know him long time and he never do anything wrong to fishermen or tell them anything not true."

Cross will best be remembered by the anglers of the State for his work in distributing and "planting" fish. There are but few places in the State where black bass are now to be found that were not stocked by him. And when it is noted that this fish is now numerous and thriving in every bit of water suited to its peculiar needs, from northern Siskiyou to southern San Diego and from the coast to the Nevada line, the magnitude of the work of planting becomes apparent.

For many years Cross had charge of the Wawona hatchery and directed the distribution that has placed trout in hundreds of miles of streams and thousands of acres of lakes in the previously barren areas lying above and beyond the Yosemite Valley. As a hatchery man his work was always above criticism.

And now we will work along without him. The spirit of manly courage, unswerving loyalty, transparent honesty and unfailing courtesy remains with us, however, to the lasting benefit of the service to which we are devoted. I saw him at his sister's home three days before he passed away. When the knowledge had come to him that his time was up, he was fully prepared to go and only sorry that he couldn't see all the boys and tell them of the wonderful experience that had come to him in his last days. "Boy," he said, "I want you to tell all the crowd how it is with me. I used to be afraid to die because I was never sure about things; but now I know that everything is all right and I'm glad to go. You be sure and tell all the boys for me, 'Sheff,' and tell them I've been praying for every one of them."

And so I am giving the message as I promised my old friend as he left on his last "detail."—*E. S.*

THE EQUITY OF THE GAME LAWS.*

By CHAS. A. VOGELSANG.

Game laws, like other laws, are made for a definite purpose, and that purpose is a wise one. So much controversy and discussion have arisen over the present game laws of this State, and so many widely divergent views are expressed, that one who is neither a hunter nor a fisherman may be permitted to present what may be called a disinterested or non-partisan view of the question, especially as close contact with friends on both sides has given the writer an opportunity to hear each side of the story, and to study the effect of our present game and fish laws.

It is unnecessary to discuss or even dwell upon the legal status of such laws, when before us is the record of thirty-eight states of the Union prohibiting the sale of game. Supreme Courts have pronounced them constitutional, wise, and just laws; our highest legal tribunal, the United States Supreme Court, adding its opinion to the credit side of

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*This article first appeared in *Western Field* for August, 1902, under the assumed name of "A. Convert." Mr. Vogelsang was then chief deputy of the California Fish and Game Commission. As it cannot now be charged that he is personally interested the article now appears under his own name. It is interesting to note that the California Fish Commission even as far back as 1902 took a decided stand against the sale of game by stating that this paper treats "fairly and forcibly a much abused and poorly understood subject," and by recommending over their own signatures the careful perusal of it.—*Editor.*

such laws, as if to make "assurance doubly sure"; so it leaves only the equity side of the question to be considered. In other words, are these laws fair? Are they based upon the great American principle of giving the greatest good to the greatest number? It is charged that they are tainted with that which is so abhorrent to every American mind, "class legislation"; that is, legislation against the masses and for the benefit of the wealthy, the "favored few."

This is the indictment that rolls so glibly from the lips of the favor-hunting politician, and that flows so freely from the pens of many of our newspaper writers. It is the stock-in-trade argument of many attorneys when "extenuating circumstances" are scarce and it becomes necessary to give the imagination free rein. Occasionally a Supreme Judge justifies his dissenting opinion by reasoning from such a viewpoint. Occasionally there is found one, like the late United States Supreme Justice Field, of sufficient mental vigor and moral courage to see and admit the error of his reasoning. His dissenting opinion written in the famous case of "*Geer* vs. *Connecticut*" is the Rock of Ages to which other dissenters pin their faith. These followers are unaware, perhaps, that Justice Field, in a conversation two years later with his friend E. S. Pillsbury, the well-known attorney of San Francisco, stated that he was "convinced that the doctrine laid down by him in the Geer case was not good law, and that he regretted that he had ever written that dissenting opinion."

No one who has given the subject a moment's serious consideration can fail to see the need of placing restrictions on the taking of wild game, both as to numbers and as to the length of the season in which they can be taken. The difference arises chiefly as to the degree of restriction, and there are inequalities no doubt. Our legislature is confronted with a serious problem when it undertakes the enactment of game laws. Our State is so large and so diversified, the conditions according to localities so varying as to breeding seasons, that a general law—the only remedy at its hands—can not fit each section to its satisfaction. When a constitutional amendment is added which will permit of dividing the State into game distrcts, then legislation for the different districts can be enacted. At present the legislature has as difficult a task as has the Federal Congress in passing a tariff bill that will suit to its satisfaction every state in the Union. Under present circumstances it does the best it can.

Many of those who criticise the restrictions do it thoughtlessly, not realizing that as civilization pushes out and extends its borders, taking up the wild lands, just so surely are the breeding grounds and habitat of the wild game reduced. The wild bird flies no faster, has no better means of defense, than it had two hundred years ago, but man has increased his efficiency to kill and take a thousandfold; advancing successively from the bow and arrow to a muzzle-loading gun, then to the rapid-firing breechloader with smokeless powder and belt full of cartridges, until finally there has been evolved the "Game Hog." Should there be any question about the wisdom of, and necessity for, these restrictions?

The charge is directly made that our legislators were guilty of framing laws in favor of the wealthy, the "favored few"; in other words, that they were either so base or so ignorant that they passed the present game laws. The cry was taken up, and it is being industriously and persistently circulated by some of the editors in the larger cities and is copied by some of the interior papers who are "long on space," that an "infamous," a "villainous" law was passed, and this in the face of the fact that our Supreme Court declared the law constitutional and in no sense discriminating. Surely one has a right to wonder and inquire: Why this sharp distinction in terms? Are these laws so unfair? Do they discriminate against the masses? Are the poor deprived of their right, and obstacles placed in their way to prevent their ever tasting game? Is it the poor who clamor so loudly? Have their wails reached the ears and pierced the hearts of these great philanthropists, or is it possible the philanthropic judge and editor have heard that cry at home, and firmly believing that "charity begins at home," are preparing to receive it? Would it be a fairer, more equitable distribution to allow the few market hunters—most of whom are not taxpayers, and often not citizens—to take that which costs them nothing to develop, either in labor or thought; to shoot and ship to the cities where it can be and is purchased only by the well-to-do or wealthy classes? In truth, it is only these two extremes of society, constituting but a small proportion of our population, who are benefited by the sale of game.

It is true that the non-sale of game deprives those living in the cities who do not hunt but who would buy game if they had the legal right to procure it in that way. But it does not deprive them of the right that any poor man in the country is glad to exercise to acquire his. The city man has that same right reserved to him, and the fact is that all those who at any time purchase game when in the markets have the means and generally the time to acquire it in the same way as the man in the country. In other words, the people who can afford to live in clubs, fine hotels, or swell boarding houses, are deprived of their easiest way to get game—that is, to buy it. Are these people the masses? Are they the sick, the blind, the poor that our philanthropic editors have in mind? Is it in their interest that this pathetic wail is set up? Have the poor suddenly acquired such influence that they can be heard in these high places; that their cries are heeded when they talk of game laws, but go unheard when they ask for better wages to buy bread and clothes for their families? Selfish interests produce strange arguments.

This does not apply to all who write against the present game laws. There are some who honestly believe these laws work an injustice, because they do not understand the subject and follow blindly these clever but fallacious arguments, and because they believe that that which deprives the poor man and favors the rich is wrong. They do not realize that the non-sale of game deprives no man of work or position; that the game dealer employs just as many men whether it be poultry or game he handles; that the same is true of restaurants, hotels, or clubs; and that in the country the industrious, intelligent farmer who owns a few acres and follows the legitimate occupation of raising geese, ducks, turkeys, chickens, or squabs for the market, and who is generally a man of family, and always a taxpayer and a citizen, receives a better return for his products than when game is allowed to be sold. Besides, when he or his sons so desire, they can take their guns (and they always have them), and go out and find some game which has not been shot or scared away by the market-hunter, who scours the country for that which costs him nothing in order to send it to the comparatively few of the wealthy in the cities who can afford to buy.

They do not realize that the present game laws are to the interest and advantage of such men, and to the disadvantage only of the market-hunter who shoots for the rich. They do not stop to contrast the two types of men—the market-hunter and the poultry-raiser—as citizens; they do not realize that every clerk, every laborer, every business man in the country can have his day afield with some profit and some pleasure; that every mechanic or man employed in business in the city can take a holiday and go into the country when game is abundant and be repaid for his time and expense. They do not stop to think that where one gun and necessary ammunition are sold to a market-hunter, twenty will be sold to men who enjoy hunting, and who will go hunting if there is promise of a fair return. In short, they do not understand that the bone and sinew of our country, represented by the great middle classes, will have an abundance of that which they do not buy, but which they can take in the way they enjoy the most.

It is true that the non-sale of game means that less game will be killed; that it can and will increase and multiply; and in that respect (incidentally) will the rich sportsman be benefited, and along with him will every poor man be a gainer. Indeed, it is doubtful if the wealthy sportsman will be so much of a gainer, since his well-stocked preserve is safe from the market-hunter, who must ply his vocation over that very land on which the poor man must of necessity depend for his pleasure and his share of game. As a matter of fact, many of the preserve sportsmen were against the present laws, because on their lands, over which none but themselves hunt, there was not noticeable the growing scarcity of game, and they objected to the wise provisions that placed a limit on the number they could shoot in a single day—a condition which placed them on the same footing with the man who does not belong to a club or own a preserve.

This brings us to the subject of preserves, and it is one that certain editors, who would like to pose as friends of the poor man, work to a finish. It is one of the subjects they revel in when recounting all the "evils" resulting from a number of wealthy men renting a piece of land, putting up buildings, hiring watchmen and caretakers, and in fact paying quite a sum monthly for the privilege of going several times a season for a shoot. Now this is not intended as a defense of preserves or baited ponds shot over from blinds—a practice that is barbarous! It is rather to invite attention to the fact that game laws have nothing to do with preserves. Will some of the learned judges and great newspaper protectors of the poor point out the connection?

Why tear down the game laws and give still greater advantages and opportunities to the preserve man? There is yet no legal way devised under our system of government that can prevent a man with sufficient means from purchasing or renting more land if he thinks he requires it, and after acquiring, controlling it, and saying how much or how little it shall be open to the public. It would seem most unwise and even childish, because of real or fancied grievances against the preserves, that the only safeguards of the poor man be torn down, simply because some one must be sacrificed. Meanwhile, the preserve remains untouched.

To follow out this line of reasoning, we should deny to a person having land that is unproductive—and nearly all shooting preserves are—the right to rent it and receive an income from it. He should open it to all comers; he should be so liberal and broad-minded that he must not object if his premises are invaded, his stock wounded or driven away, and his fences destroyed; but he should sit calmly by—and wait for the tax collector. If he dared lease it to a man or number of responsible men who would take care of it and pay him besides, he would be committing an offense. Why not go a step further and advocate that, in a city supplied with street railways on which every one can ride for five cents, it shall be an offense against the public morals, peace of mind, etc., for any person to ride in any other way?

Another of the arguments frequently used is the pointing out of the hardships and suffering imposed upon invalids who "must" have game and are unable to purchase it. If that has any value, then there should be no close season whatever, no restrictive measures, else all the invalids would die during the eight months of close season; otherwise there are but four months in the year when they could exist, and now even that lease of life by our present "infamous," "villainous" game laws has been swept away. Unfortunately, statistics of the mortality are generally omitted. Is it not a fact that the sick of the masses or middle classes would appreciate a young squab, or the young of any other domestic fowl? Can they not be purchased at all seasons of the year, and as cheaply as game (when sold)? Does not that sale benefit the dealer, and also some other man following a legitimate occupation in the country?

Are we not growing more ardent year after year for active, health-giving outdoor life, for the strenuous life in the fields? What greater attraction does the country offer, whether one is camping or at a country tavern, than the promise of a well-filled basket or bag? What resort does not advertise—even when they have it not—its fishing and hunting? Does not that attraction, besides giving new vigor and health to thousands, mean the better circulation and distribution of the city's wealth? Is it not a positive benefit both to the city man and to the brother in the country? The present game laws are accomplishing the purpose for which they were enacted. One has but to travel in the country, anywhere, to see and appreciate the effects. Never in years have the quail and doves been so numerous. Deer are increasing, and there will be plenty for all. And it belongs to all—the people in the country as well as the people in the city. Under the existing laws the greatest good to the greatest number will be accomplished.

"With malice toward none and charity toward all" the foregoing is respectfully submitted, and with the hope that a little more serious consideration of all the aspects of the case will show that our present game laws are not only legal but also equitable.

THE CALIFORNIA VALLEY QUAIL AND INTRODUCED GAME BIRDS.

By GEORGE NEALE,
Assistant, California Fish and Game Commission.

Civilization and population forcing itself westward and into communities where game is or was once abundant, make new measures necessary in order to protect the existing game fauna of California. When these measures are not taken, history shows that certain species, those most easily killed or captured and those whose reproduction is less prolific, will be eventually exterminated.

The band-tailed pigeon is a good example of a species nearing extinction. This bird was once almost as numerous in California as the passenger pigeon was in the eastern and middle states. Only a remnant of the former numbers now remains. The records of the cloud-obscuring flights of the passenger pigeon seem like a fable, except to those who have seen and know. The few remaining mourning doves, once so numerous in California, furnish another example of the passing of species. The western mourning dove, sometimes called Carolina dove, is nearly as strictly migratory as waterfowl. Especially in northern California is the dove not a resident species. It nests throughout the State but its winter home is the southwestern portion of the United States as far as Mexico. The writer has seen the fall migration through New Mexico and along the line of the Mexican Central Railroad from the Rio Grande nearly to Mexico City. It is true that some doves remain in the southern valley portion of the State the whole year, as do a few migratory ducks and other birds.

Our laws have not given the dove proper protection. We have permitted them to be killed in the nesting season and on the nesting grounds, in what we term the open season. If this killing were permitted on the northern breeding grounds of the ducks and other waterfowl, what a protest would be made from California! From my own observation it is a conservative statement to say that the dove and band-tailed pigeon have decreased eighty per cent in northern and central California in the last twenty-five years.

The most flagrant cause of the near extermination of species is to be found in the unthinking or uncaring attitude of the people of the State. An added factor to be considered is the fact that certain species are not prolific in their reproduction, rarely having more than one or two eggs. Hence, in many seasons the whole, or at least part of the total increase of these birds may be destroyed by predatory animals or by human beings. This is true not only of the family Columbidæ to which the dove and pigeon belong but of the family Ardeidæ (egrets, herons, etc.) which are so much sought for by plume hunters, especially in the mating season. These birds are of a confiding nature, easily approached on the nest, and so make an easy prey to the gunner or netter. Consequently, our efforts should be centered in protecting those birds which are under natural disadvantages. But this is not enough: all of our game birds need to be intelligently conserved.

The protection now given many species of migratory birds by the United States Department of Agriculture will no doubt have a beneficial effect in perpetuating those birds not entirely exterminated.

The only game bird that has proved itself able to survive in the face of all the obstacles presented by encroaching civilization is the California valley quail (*Lophortyx californica*). This bird is able to care for himself under any and all existing conditions if given a square deal. It adapts itself readily to all conditions, and is the peer of any game bird in the world. This bird is also capable of taking the conceit out of any champion at the traps, and makes a dog well-trained on other game look like a tyro. It uses judgment in flight, when flushed, which a military expert would call masterly; and even when wounded it shows all the qualities of a strategist. Always willing to match its brains against those of the gunner, it, in most instances, meets with success. In egg production the valley quail excels all other game birds, not excepting the pheasant, partridge, grouse or sage hen, scarcely ever laying less than eighteen eggs at one year old, and at three years frequently laying twenty-two or more eggs. Furthermore, it usually succeeds in hatching and raising all or a very large percentage, and frequently hatches a second brood. This is nearly always the case if the first nest is destroyed. Quail eat almost any seed or wild berry. Noxious weed seeds are destroyed in great numbers; hence they are most useful birds to the farmer, orchardist or vineyardist. I believe the quail ranks highest as an insectivorous game bird.

The quail is one of the only game birds which is attracted by civilization, and if not molested this bird will make its home near a farm cottage. The valley quail is king of all he surveys, pugnacious to a high degree, and will hold his own against any other bird encroaching on his domain. He is always true to his mate, is invariably non-polygamous, and always chooses his own mate in captivity or freedom. This bird has survived a four months' open season with a bag limit of twenty per day, or 140 per week. It has been hunted with the best dogs in the world, chased with something like 121,664 automobiles fully armed, and rapid fire automatic and pump guns in the hands of 159,164 hunters. It is surely a marvel that any of these birds still remain.

The range of the valley quail in northern California is from sea level to 3,000 feet above, rarely ever being found above this elevation. The valley quail is not migratory, except under adverse food conditions. Only at times do they wander far from their feeding grounds, and they invariably return each season to the place where they were raised.

In over thirty years' experience in the field with this bird, from the south line of its range to its northern limits, I have never seen a sick or diseased valley quail. They are strong moulters, and this perhaps insures their being practically immune from disease. Of all the gallinaceous birds, *Lophortyx californica* is the fittest representative of the game bird family. Hence he will continue to prove the survival of the fittest. If the time ever arrives in California when all our game is on the verge of extermination, this grand game bird will be one of the last to disappear.

Our efforts to avert this rapid extermination of bird life by the introduction of new species of game birds into California has not met with success commensurate with the expenditure of money. One reason for this may be the pugnacity of native game species. Wherever other varieties of game birds not native to California have been introduced on lands where California valley quail live, failure has always followed. This bird will always fight against the usurpation of his territory by other birds. It will attack a cock pheasant as readily as a small bird. Hence there are good reasons why it should be the one dominant game bird.

The following instance of pugnacity on the part of the valley quail has come to my notice. Mr. Hollenbeck of Ryer Island, California, who is a great lover of birds and animals, encouraged a large band of quail to remain on his land by prohibiting shooting. He fed the birds every few days, and they became so tame that they even came inside the house when called. In fact they were so tame as to almost be a nuisance. Knowing Mr. Hollenbeck's fondness for birds, I obtained for him some ring-necked pheasants. The quail, however, have driven away these pheasants, so that they are now to be found only in localities where quail are not found.

There may still be another reason why introduced game has not increased. Many people believe that all that is necessary in the introduction of a game bird into any locality is just a matter of securing the species to be introduced, giving the birds their liberty and awaiting favorable results. But the fact that a Master Hand has not only distributed game birds and animals, but has adjusted the flora and fauna of the universe to certain life zones most suited to their existence, is often overlooked. We must know the conditions and seek to introduce such birds as will thrive under them. No game bird has as yet been introduced into California which has proven to be adapted to the geographical and climatic conditions obtaining here.

One of the principal reasons for our failure in the introduction of game birds in the past has been that none but ground-roosting birds have been selected. As a result they have been attacked by predatory animals. These latter are possibly of a larger variety and more numerous in California than in any other state. The valley quail has at some time had to adapt itself to these conditions. This bird is now a tree or bush-roosting bird, and this makes it practically immune from the depredations of these numerous animals. On the other hand the Hungarian partridge, bobwhite, pheasant and other quails are ground-roosting birds. Therefore these birds are subject to depredations from the many animals which roam and feed at night and can not obtain the foothold which they should in California.

Let us keep in mind our experiences of the past and see that birds more suited to our conditions are introduced—or better still, that such hardy birds as the California valley quail are sufficiently protected to make stocking with foreign game birds unnecessary.

THE SISSON FISH HATCHERY.

By H. C. Bryant,
Game Expert, California Fish and Game Commission.

For nearly forty years the State of California has been artificially rearing fish and planting them in the streams of the State. As a result our streams are well stocked with fish. Probably over ninety per cent of the fish in most of the streams of the State at the present time have been reared in State hatcheries. A person who simply reads the biennial reports of the Fish and Game Commission, where he sees statements as to the millions of fish planted in the streams of the State, can not realize the tedious and painstaking work needed to make such statements possible. Experienced workers are needed to bring the fish from the egg stage to the size when they can be safely planted in the streams. Then, too, whereas a small amount of care is needed for rearing a small number of fish, added care needs to be exercised when millions are being reared. A trip to one of the hatcheries can alone bring convincing evidence of the work being accomplished.

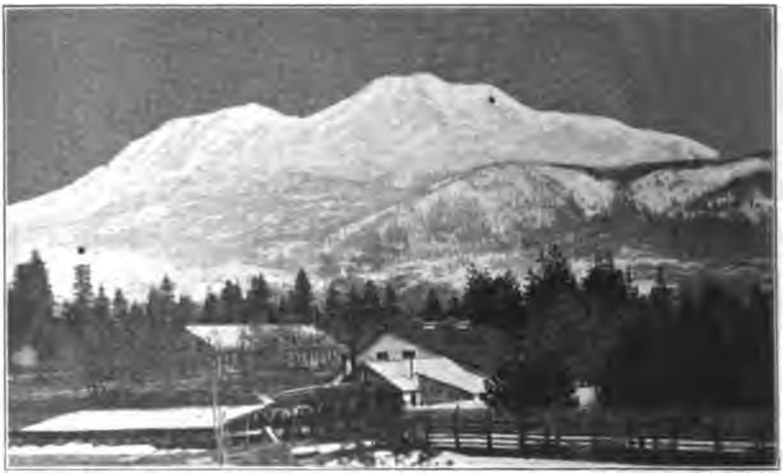

Fig. 34. The Sisson Fish Hatchery, March, 1915.

The State of California owns and operates six hatcheries. The largest and best equipped of these is the one located at Sisson, Siskiyou County. Under the charge of Mr. W. H. Shebley, Superintendent of Hatcheries, the Sisson Hatchery has evolved from a small plant with an output of a few thousand fish to what is probably the largest hatchery in the world. Mr. Shebley received his first training under his father, Mr. J. V. Shebley, who originally owned a private hatchery in Nevada County. While still a boy, Mr. W. H. Shebley, the present superintendent, was hired by the then newly-established Fish Commission to plant fish in different parts of the State. In 1885 he succeeded his father in charge of the Shebley Hatchery. Four years later he became superintendent of the Hat Creek Hatchery on the Pit River and since then he has at different times been in charge of nearly every hatchery in the State. The first hatchery building at Sisson was erected in 1888. In 1893, Mr. Shebley was placed in charge, but even after that time he managed the planting of fish throughout the State and in most cases superintended the work personally. In the early days he did practically all of the work himself, spawning thousands of fish and caring for the eggs and fry both day and night.

The present article would make more interesting reading could the author have visited Sisson Hatchery twenty years ago so as to have made a comparison with the hatchery as it exists today. The few following comparisons have been made possible by reference to old reports. The site chosen for Sisson Hatchery has left nothing to be desired. Situated near one of the tributaries of the upper Sacramento and near what is known as "Big Spring," an abundance of pure cold water has constantly been available. Not only has the location proved valuable in this respect, but it has the added charm of being beautifully situated, with Black Butte in the foreground and Mount Shasta, covered with eternal snow, a little farther away. Originally one small hatching house, a plain wooden structure forty by sixty feet, equipped with forty-four troughs, and about half a dozen ponds, were constructed. At the present time there are five large hatching houses with several auxiliary "batteries," and fifty-two ponds on the grounds. The state owns seventeen acres. This is well fenced and has a comfortable home for the superintendent, several cottages for employees, barns and other needed buildings. In addition the grounds have been made very attractive by trees, flower gardens, and several small aquaria. Consequently, during the summer season as many as two hundred persons visit the hatchery daily.

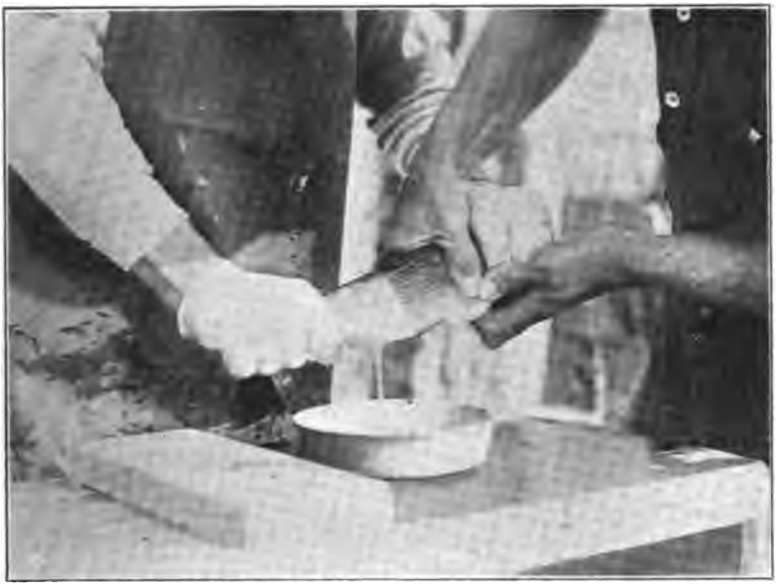

Fig. 35. Artificial spawning of a rainbow trout. The eggs are "stripped" from the fish into a small pan.

A trip through the grounds gives one a surprisingly increased knowledge of the work which this State institution is accomplishing. For instance, let us start in the main hatchery building. After passing the offices of the superintendent and his secretary, we are confronted with long lines of troughs through which streams of cold water are constantly flowing. In these troughs can be seen thousands and thousands of trout fry, most of them at this time of the year (March) two or three months old. We are told that there are about twenty-five thousand fish to each trough, and the black moving mass convinces us of the truth of this statement. The troughs are all painted white and the water is exceedingly clear, so that the dark-colored fry are very conspicuous.

As we leave this building, we walk between a number of large trout ponds containing fine large specimens of several different species. In one pond may be seen Loch Levens, the original stock of which was imported from Scotland. In another pond can be seen eastern brook trout, smaller, but beautifully spotted fish. In still another pond rainbow trout, that fish par excellence of the California fisherman. Some of them are larger fish than most fishermen have ever seen. These fish are kept from year to year in the ponds and from them many of the eggs used for hatching are procured.

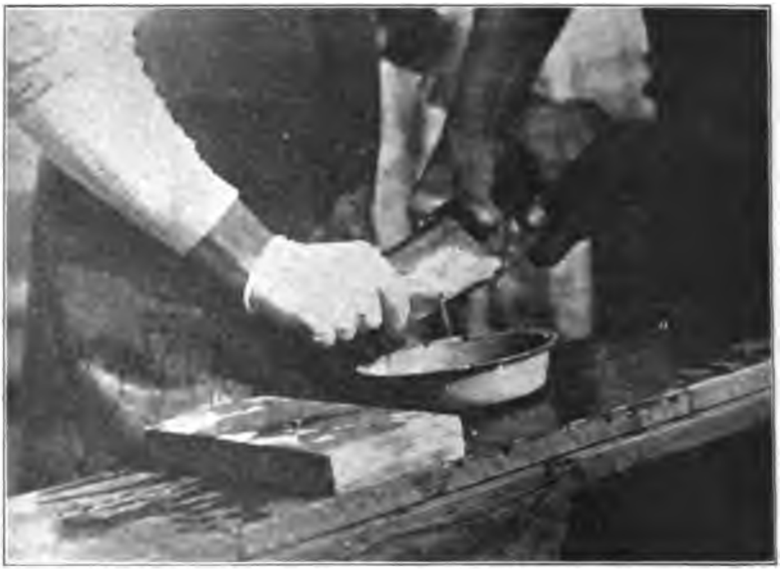

Fig. 36. Eggs of a rainbow trout being fertilized with milt from a male trout.

In order to prevent screens from clogging with leaves and other debris at the point where the water flows out of the ponds, a peculiar type of screen has been invented. This consists of a cylinder covered with wire netting, continually revolved, the power being supplied by a paddle-wheel attached close by.

There has been much discussion as to whether the "pond system" is a more effective means of procuring the eggs needed for hatching than the "trapping method" now almost exclusively used. This latter method consists of trapping the trout when they are running up stream to spawn, spawning them at the stations where they are caught, and shipping the eggs to the hatchery. This method, although as a rule proving very successful, is always somewhat unreliable, for the number of fish trapped for spawning purposes is variable from year to year. Pond-reared trout can always be depended upon. Consequently, Mr. Shebley is endeavoring to expand the pond system in order that a supply of eggs may always be procurable no matter what the run of fish is in the streams. By purchasing a few additional acres, the State could increase the pond system sufficiently to maintain a sufficient breeding stock, and thus assure a good take of eggs each year.

We have now reached the spawning house. Here three men are at work spawning rainbow trout. One tank is filled with female fish and the other with males. One man takes out a fish, another man wearing cloth gloves takes hold of it firmly, and a third man "strips" it. (See figs. 35 and 36). When a small pan of eggs is procured "milt" is obtained from a male fish in the same manner and the eggs are set in a dark place for a few minutes until fertilized. Several thousand eggs are often obtained from a single fish. When fish are found "unripe" they are returned to tanks where they are kept for several days after which they are again tested. The operation of spawning appears to the observer as though it would seriously injure the fish. However, this is not the case, for fish have been successively spawned at Sisson for as many as five years.

After the eggs are fertilized they are placed in a wire basket hung in a trough of running water. After a week or more each tiny fish has become large enough so that it can be seen inside of the egg. At the age of three or four weeks, the fish hatch out. Unlike birds, however, they hatch tail first. Attached to the under surface of each tiny fish is a large bag or sac containing yolk. The young fish feed on the material in this yolk sac for two to three weeks. By that time it becomes entirely absorbed and the fish begins to take food for itself During the period when fish are unable to take food, they are rather sluggish and remain very quiet. Later, however, they become very active.

Many of the salmon and trout eggs used for hatching are procured at "spawning stations" at the headwaters of the larger rivers. Racks are placed on the smaller creeks up which the fish run to spawn. (See fig. 37), and large numbers of "ripe" fish are entrapped and spawned artificially. During the fall of 1914 the United States Bureau of Fisheries secured in this manner over 30,000,000 salmon eggs. These were turned over to the California Fish and Game Commission and a very large proportion of the eggs hatched out. Three of the hatchery buildings at Sisson were needed to take care of the eggs and fry.

A visit to the other hatchery buildings discloses millions of salmon eggs and tiny salmon which have just hatched. The eggs of the salmon, in contrast to the dark-colored eggs of the trout, are reddish in color. In order to obtain the approximate number, the eggs are measured into the baskets with a measuring glass the capacity of which is known. In some instances from 30,000 to 35,000 salmon eggs are placed in a single basket. After the eggs have hatched the number of fish in each trough is usually reduced to about 25,000.

A large force of men are employed in keeping the troughs clean. All sediment and debris from the water is swept out of the troughs and all dead eggs are removed by means of a pipette. Both eggs and young fish are parasitized by certain bacteria and care must be taken to see that all infected individuals are removed to prevent spread of the infection.

In order to feed the millions of fish at the Sisson Hatchery, it is necessary to maintain a kitchen where food is prepared. From six hundred to seven hundred pounds of this prepared food is fed to the fish every day during the rearing season. In order to make this amount of food it takes about three hundred pounds of meat. This is obtained from slaughter houses in San Francisco. The food is prepared by taking such scraps of meat as beef heads, livers, lights, and the like, grinding them up, mixing them with corn or other meal, and clabbered milk, and cooking this into a sort of mush. The pond fish soon learn to know the man who feeds them, and they will follow him about from one side of a pond to the other. When the food is thrown into the pond, there is a wild dash for it, and the water flies in every direction. In addition to this food the pond fish often obtain insects which alight on the water, and not infrequently a trout can be seen "jumping" for such delectable morsels. A similar kind of food is prepared for both the trout and salmon fry.

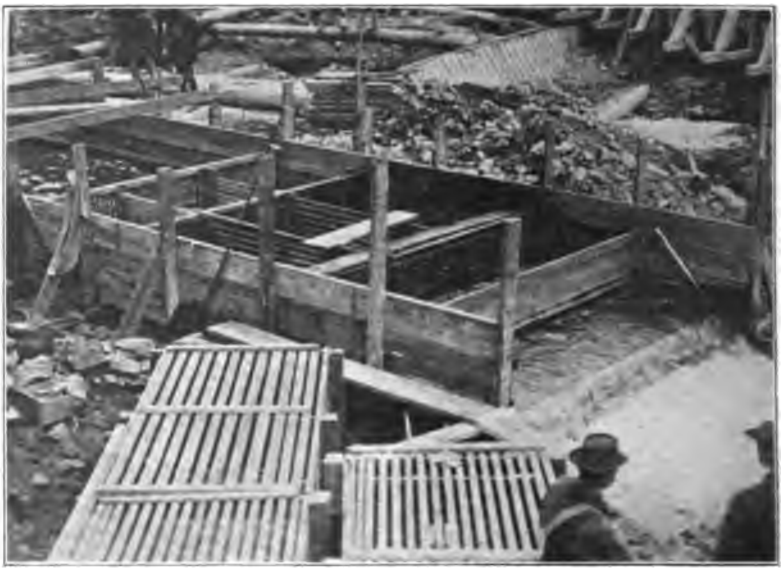

Fig. 37. A fish trap on the Klamath River at Copco, California. Thousands of fine large trout were obtained for spawning here.

When the fry are old enough to care for themselves, they are placed in "nurseries," small ponds made especially for the small fish. As pond trout and salmon are somewhat cannibalistic, it is necessary that the fish be of about the same general size in each pond. Fry are kept in these nurseries until ready to be shipped to different parts of the State. The State owns its own fish distribution car which carries the fry to the nearest railway terminus. From the railroad station the fish are carried into the higher mountains by means of auto trucks, wagons and pack animals.

All trout are very much subject to disease, and it is therefore necessary that they be continually watched to prevent an epidemic. Mr. Shebley has devised several methods of treating the sick fish. Some are given an antiseptic bath, others are cured by having the parasitic crustaceans removed from their mouths and gills. Nor is disease the only thing with which a superintendent of a hatchery has to contend. For instance, a number of years ago, Mr. Shebley found many fish dead in the ponds. Examination showed that the stomach of each fish contained a number of little pebbles. Evidently the food which they had taken forced the fish to attempt to procure grinding material and this had eventually caused their death. In another instance the stomachs of dead fish which were examined were found to contain small masses of cobweb. Investigation showed that the meal used in the food was badly infested with meal worms, and the webs made by these worms had formed little balls in the stomach, and so had caused death. Slight carelessness often results in heavy losses. It has only been by careful attention to details and by continued study of the diseases attacking fish that this large hatchery has been made so successful.

The California Fish and Game Commission can point with pride to its accomplishments along the line of artificial propagation of fish. Had no work in other directions been done, the Department of Hatcheries has accomplished results which will justify all the expenditure of the Commission in years past. The degree of perfection to which the stocking of our streams has been brought is truly remarkable. We wish that as great success could be obtained in our attempts to restock our game covers, but so far this newer work has largely failed. Conservationists are searching for the man who can put game propagation on the same plane with fish propagation.

TWO KINDS OF CONSERVATIONISTS.

By W. P. Taylor.

Curator of Mammals, California Museum of Vertebrate Zoology.

Only a little study of the conservation situation in America is sufficient to show we have allowed certain parties at interest to take more than their rightful share of the resources of wild nature which as a matter of simple justice belong, not only to all the people now living, but also to the generations of the future indefinitely. Only a little study suffices to emphasize certain obvious necessities which must be complied with if we are to bring to bear any effective remedy.

It is at this point that there is an unconscious separation of the people into two groups; the apathetic and the active.

It is worse than useless to know the facts and necessities of the game conservation situation if we are not willing to translate inclination and impulse into action.

There are two kinds of conservationists; the conservationist of the folded hands and the conservationist of the clenched fist.

There is much to be done, and it will not be done by the conservationist of the folded hands!

Will you permit one who has been close to the firing line to offer some suggestions to those who have the welfare of our resources in fish and game at heart? First and foremost, read and promote the circulation of Dr. William T. Hornaday's two books "Our Vanishing Wild Life" and "Wild Life Conservation in Theory and Practice." Join some society which is active in the fight to save the game, such as the Cooper Ornithological Club, Sierra Club, California Audubon Society, State Humane Association, the Wild Life Protective League of America or the California Fish, Game and Forest Protective League. Enlist the interest of the societies and clubs of which you are already a member in the study of nature and in the preservation of our natural resources. Organize a local Audubon Society or a Sportsman's Game Protective Association in your home town. If you desire information along any of these lines write to Dr. Harold C. Bryant, Game Expert, California Fish and Game Commission, University of California, Berkeley, California, and you will receive generous and sympathetic assistance.

Certain communities in the mountains of California apparently have no interest whatever in game protection. In other communities in similar situations the conservation tide runs strong. I can not escape the conviction that, in these latter cases, interested and enthusiastic individuals have leavened the whole lump, have transformed their communities from opponents to supporters of preservation of wild life.

Put your hand to the plow, and never look back till what you desire has been accomplished. Write articles for your local papers, tell the boys of sling-shot and air-gun age what kinds of birds it is lawful and what kinds it is unlawful to kill. Get in touch with your game warden, express an interest in his work and an appreciation of his services. Assure him of your hearty co-operation in his labors for the protection of wild nature.

Storm the citadels of indifference, show your friends that whatever preserves the natural attractiveness of our State is good business. Emphasize the dangers of the *laissez faire* policy.

If you are a teacher, commend the protection of wild life to your pupils, and lead them to a love for the out-doors.

If you are a professional man, contribute articles to your professional journals, and initiate and give vigorous support to movements for a better sentiment in your own community.

If you are an editor, upon you, in no small degree, will depend the education of your city along these lines.

If you are a member of a woman's club, secure the interest of your organization in the work of saving the game of California. Communicate with Mrs. Harriet Williams Myers, 311 Avenue 66, Los Angeles, California, chairman for Wild Life Conservation, California Federation of Women's Clubs, and promise your co-operation.

If you are a sportsman, join with others and form an organization for game protection. Take "law enforcement" as your slogan. Do what you can to set up and maintain high standards among the men who hunt.

If you are a farmer, learn to know your friends among the wild mammals and birds, and see to it that the individuals or species you would condemn as hurtful to your interest are guaranteed a fair trial at least before execution. Provide food plants, shrubbery and nest-boxes for beneficial birds, and reserve a part of your acres as a sanctuary where game may be safe from molestation.

If you are a parent, inculcate in your children the highest possible ideals in the matter of preservation of all our natural resources, and train them up, by precept and example, to avoid individual and social wastefulness.

If you are a plain citizen, then yours is the heaviest responsibility and the highest privilege of all; for you must decide through ballot box and personal influence what shall be done with California's wild game.

I believe that all true sons of California, whether native or adopted, are idealists and love justice and square dealing. We have been accustomed since the days of the rugged Forty-niners to good-natured contests of one sort or another, and fair play is a tradition wrought into the fiber of our commonwealth. All considerations of justice, square dealing and fair play lead with inevitable certainty to the conclusion that we hold those natural resources which still remain to use in trust for the generations of the future; and that while we may legitimately take toll of these possessions, we must not impair the seedstock.

The Taj Mahal of Agra, India, is said to be the most beautiful building in the world. Its construction occupied ten thousand men for twenty-two years. Yet a few vandals could wreck it overnight, so much more rapidly do the forces of destruction work than those of construction.

The building of living species, the end results of the consummate art of Nature, has occupied the Creator for a time so long that we can no more than guess at it. Yet we of this generation can permit of the utter destruction of some of these species.

It is doubtful whether the Taj Mahal could ever be replaced were it to be destroyed, but it is *certain* that living species, once destroyed, can never be replaced. Man, the king of creation, even at this the summit of his glory, cannot undo extermination!

It is as sure as death that we will be held responsible for our acts by the generations of the future. We ought to be held responsible. Let us keep the faith!

RECENT FISH LEGISLATION.

By N. B. Scofield.

The Districting Bill.

(Senate Bill No. 681. Senator Flint.)

A bill has been passed by the legislature and signed by the Governor which makes some radical changes in the fish and game districts of the State. At the present time the State is divided into seven fish and game districts which were created so that different parts of the State could have fish and game seasons that would conform to the different conditions of each. Besides these seven districts many smaller reservations and refuges have in the past been created, such as Cache Slough, Napa River, Mokelumne River, Catalina Island, the two reservations in Monterey Bay and many others. Laws have from time to time been passed regulating the fishing in each of several streams, as in Smith River, Klamath River, Eel River and Sacramento River. A recent court decision has held that as the State has been divided into fish and game districts, as provided by the constitution, for the purpose of making appropriate laws for each respective district, a law to be constitutional must apply to the whole of one of the districts. Under this decision the laws regulating the fishing in a stream or part of a stream, or in any bay or part of the coast waters, or the hunting in any portion of the State other than the whole of one of the seven districts, would be unconstitutional. It therefore appeared necessary to redistrict the State and wherever special laws were required to make of that part a separate district.

The bill as finally passed, dividing the State into thirty fish and game districts, was drawn to take care of these separate and different conditions. There are four main districts, Nos. 1, 2, 3 and 4, which, with the exception of a few game refuges, takes in about all the land of the State and might be called game districts in distinction from fish districts. The districts Nos. 5 to 23 inclusive are fishing districts, which in the main cover the same territory and follow the same lines in conformity with the present laws covering the same. For example, Nos. 5, 6 and 7 are the commercial fishing areas for Smith, Klamath and Eel rivers, respectively. The districts Nos. 24 to 29 are game refuges, some of which are new.

The bill has met with some criticism on the ground that it is a complicated arrangement and a fisherman or hunter will never be sure what district he is in, but when one knows what the present laws are and the boundaries as defined at present he can easily see that the new "districting bill" simplifies rather than complicates. Many special fishing districts have been cut out and the seven main or game districts have been reduced to four. What makes it appear complicated at first sight is that many of the boundaries as they already exist in the present laws are brought together in one bill. It will be found that the laws will be simpler and more easily understood and that under the new system of districts many of the present laws have been eliminated.

The four main fish and game districts are exclusive of the remaining districts and can easily be understood by consulting the accompanying map (fig. 38). The districts 5 to 29, to describe them very briefly, are as follows:

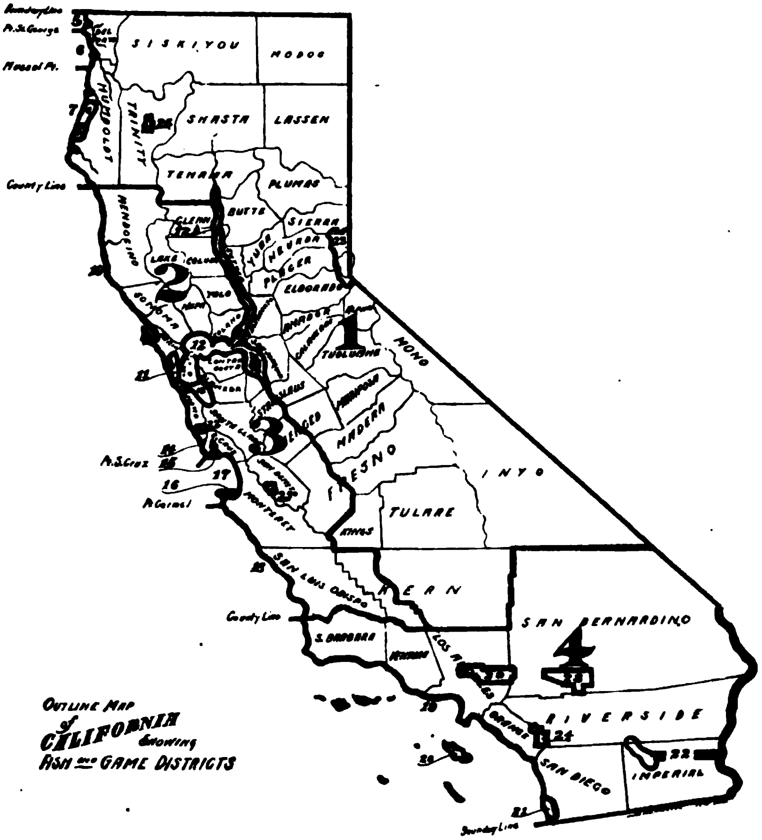

Fig. 38. Map showing new fish and game districts. Many of the districts along the coast have reference only to laws on fish. Although seemingly making laws more complicated, the new districts will in reality improve fish and game administration.

No. 5. The ocean waters and the tide lands of Del Norte County north of Point St. George and including the lower part of Smith River.

No. 6. The ocean waters and the tide lands of Del Norte and Humboldt counties lying between Point St. George and Mussel Point and including the lower end of Klamath River.

No. 7. Consists of the ocean waters and tide lands of Humboldt County lying south of Mussel Point and includes the lower end of Mad and Eel Rivers.

No. 8. The waters of north Humboldt Bay.

No. 9. The waters of south Humboldt Bay.

No. 10. The ocean waters and tide lands of Mendocino, Sonoma, Marin, San Francisco, San Mateo and Santa Cruz counties as far south as Santa Cruz Point and includes Tomales Bay and excludes Bolinas Bay and all lagoons.

No. 11. The waters and tide lands of the Golden Gate and of Richardson Bay.

No. 12. The waters and tide lands of San Francisco Bay, except the portions included in districts 11 and 13; the waters and tide lands of San Pablo Bay, of Carquinez Straits and Suisun Bay; the waters in the main channel of the Sacramento River, Steamboat and Sutter sloughs as far up as Colusa; the waters of San Joaquin River, Old and Middle rivers to the south boundary of San Joaquin County.

No. 12a. The waters in the main channel of Sacramento River from Colusa to Vina.

No. 13. The waters and tide lands of south San Francisco Bay.

No. 14. The waters of the lower six miles of Scotts Creek, Santa Cruz County.

No. 15. The waters of San Lorenzo River and tributaries and Monterey Bay waters and tide lands lying north of a line from Point Santa Cruz to Soquel Point.

No. 16. The waters and tide lands of Monterey Bay lying south of a line extended east from Point Pinos.

No. 17. The State waters and tide lands of Monterey Bay not in 15 and 16 and the State ocean waters and the tide lands to Point Carmel ("Point Lobos") in Monterey County.

No. 18. The State ocean waters and the tide lands from Point Carmel to the north boundary of Santa Barbara County.

No. 19. The ocean waters of the State and the tide lands from the north boundary of Santa Barbara County to the south boundary of San Diego County and includes all the islands and surrounding State waters and the tide lands, except Catalina.

No. 20. Island of Catalina and surrounding State waters.

No. 21. Waters and tide lands of San Diego Bay.

No. 22. Waters of Salton Sea and Colorado River.

No. 23. Land and waters within Lake Tahoe and Truckee River drainage basin.

No. 24. Cleveland National Forest in Orange and Riverside counties.

No. 25. National Pinnacles Monument, a park in San Benito County.

No. 26. Trinity National Forest, a park in Trinity County.

No. 27. State Redwood Park, Santa Cruz County.

No. 28. A portion of the Angeles National Forest in San Bernardino County.

No. 29. A portion of the Angeles National Forest in Los Angeles County.

Bills Relating to Fish.

(Senate Bill No. 155. Senator Kehoe.)

The bill amends section 629 of the Penal Code and relates to the screening of irrigation and power ditches to prevent young trout and salmon and other fish from entering them and becoming lost. The change in the section provides that the parties concerned be given a hearing, and details the method by which the hearing may be had and the evidence taken.

(Senate Bill No. 688. Senator Mott.)

This bill changes section 628*b* of the Penal Code making the close season for black bass in all districts except 3 and 4 from December 1 to April 30, inclusive; and in districts 3 and 4 from December 1 to March 1, inclusive. It makes the close season for Sacramento perch, crappie and sunfish in all districts from December 1 to April 30. It prohibits the sale of black bass, Sacramento perch, crappie and sunfish. In other respects the section remains the same as at present.

(Senate Bill No. 699. Senator Brown.)

The bill deals with trout and amends section 632 of the Penal Code. Section 632½, which deals with steelhead trout, is repealed and the steelhead, rainbows and cut-throat trout are all classed under the word "trout" with the object of doing away with the question of: What is the difference between a rainbow and steelhead?

The trout limits are not changed. The close season for districts 1, 4, 5, 6, 7, 8, 9, 19, 21, 24, 26, 28 and 29 will be December 1 to April 30, inclusive. This is a change from the present season in that it will open fifteen days later in Del Norte and Humboldt counties and will open one month later and close one month later in southern California. This is a better season and meets with general approval. The close season for districts 2 and 3 and in the included and minor districts is from November 1 to April 30, inclusive. The present season in the counties covered by district 2 opens fifteen days earlier than this for trout other than steelhead and one month earlier for steelhead. The season for all trout opens one month later than at present in district 3. In district 23 (waters of Tahoe and Truckee basins) the season will open June 1, which is one month later than the present law. It will be unlawful to take trout within 500 feet of the mouth of any stream or in the lower two miles of any stream in this district between November 1 and July 31, inclusive. The same provision for the taking, shipping and selling of twenty black spotted, Tahoe trout irrespective of weight, remains in the law but applies to districts 23 and 1.

The bill provides for taking two trout a day with hook and line or spear in district 2 between December 15 and February 14. Under the present law steelhead to the extent of 30 pounds a day may be taken any place in tide water up to January 1, but with hook and line only.

The bill provides for marketing the steelhead caught while fishing for salmon in districts 5, 6, 7, 8 and 9.

(Senate Bill No. 705. Senator King.)

The bill amends section 634 of the Penal Code and relates to salmon. The present laws are arranged to conform to the new districts and several other changes have been made, as follows: The open season is extended five days to September 25 for district 12 and the ocean districts south of Humboldt County. District 12*a* was made to protect the salmon in the upper Sacramento River and a close season is given it from May 15 to December 31. This arrangement protects the salmon of the fall run while on the spawning beds and protects the latter part of the spring run. For several years the salmon hatchery at Baird on the McCloud River, the only hatchery which takes eggs from the spring run, has not been able to take a sufficient number of eggs from the spring run to supply the one hatchery and the run is becoming lighter each year. It is believed this arrangement will restore the McCloud River run to something of its former importance. The fishing in this upper portion of Sacramento River (district 12*a*) is carried on with seines which are dragged through the holes, taking practically all the salmon in the river, unless the water happens to be too high to operate the nets. This up-river fishing should in time be eliminated. There is no other stream in which salmon netting is allowed for so great a distance. On the Columbia, for instance, the netting is allowed for only half the distance.

For districts 12 and 12*a* and the ocean district below Humboldt County, a minimum mesh of 5½ inches is provided for salmon nets.

The close season for district 5 (Smith River) is from December 1 to September 30. This season protects the latter third of the quinnat and silver salmon runs and also gives sufficient protection to the steelhead run. The present close season for the river is entirely wrong, the close season apparently being meant for the open season. There is a 6½ inch minimum mesh provision as in the present law. Seines are prohibited.

The close season for districts 7, 8 and 9 is made from December 8 to October 6, inclusive. District 7 takes in the lower netting area of Mad and Eel rivers. This season with the netting limit placed at the east line of township 3 is a better arrangement for all concerned than they have had on Eel River for many years. The salmon and steelhead are, for the present, anyway, given ample protection and as the seines are eliminated and gill nets can only work at night, the sportsman angler will not be interfered with and should be satisfied.

The season for district 6 (Klamath River) is left the same, as it is entirely satisfactory. Daylight fishing from August 1 to September 5 is prohibited on the river. This was to stop the bar fishing which was monopolized by a few daring ones to the dissatisfaction of the others, and it was thought this bar fishing kept the fish from entering the river.

A close season is provided for salmon in district 15 (San Lorenzo River and a portion of Monterey Bay) from September 1 to April 14. This protects the salmon while they are running in San Lorenzo River, where it is wished to establish a run of salmon from the "plants" already made, and it allows trolling in the bay part of the district during the summer run.

The bill provides for the importation of Dolly Varden trout and any species of salmon, other than quinnat salmon, during the close seasons in the State, but they are to be invoiced and tagged and otherwise kept track of. The bill also defines salmon and fixes the steelhead as a trout, so that there should be no trouble in the future, under the law, in showing that the steelhead is not a salmon.

(Senate Bill No. 741. Senator Gerdes.)

Adds a new section, No. 628*h*, to the Penal Code prohibiting the planting in the waters of the State any fish, shell fish, crustaceans or mollusks (except oysters) taken within or without the State, without getting a permit from the Fish and Game Commission. The object of this law is to prevent irresponsible persons from introducing species into our waters that might do great harm.

(Senate Bill No. 755. Senator Flint.)

The bill amends section 635 and includes section 374½ of the Penal Code. Deals with the use of explosives for killing fish and adds a few substances to the list of materials that are considered deleterious to fish or plant life.

(Senate Bill No. 768. Senator Scott.)

This bill amends section 628 and incorporates section 628*g* of the Penal Code, and relates to crabs, spiny lobsters, abalones and catfish. It reduces the close season on red abalones from three months to the one month of February, and prohibits the drying of abalones. It forbids the importation of spiny lobsters taken within ten miles of the California boundary. This provision is designed to protect the lobsters of the Coronado Islands, which it is believed migrate back and forth across the border. It adds fifteen days to each end of the present close season on catfish. The section was also revised to fit the new fish and game districts.

(Senate Bill No. 826. Senator Campbell.)

This bill amends section 628*f* of the Penal Code which relates to clams. The bill provides for a limit of 50 Pismo clams for one calendar day instead of 200 (which is the present law). It also reduces the size limit of Pismo clams from 13 inches in circumference to 12 inches for the minimum size to be taken or had in possession.

This bill also places a limit of 1½ inches minimum size on cockles, hard-shell, or little neck clams when measured in the greatest length, exclusive of the curve of shell.

There is also a provision in this bill which makes it a misdemeanor to ship or transport any clams or crabs which have been taken in fish and game districts 5, 6, 7, 8 or 9. The bill also includes Humboldt County laws relating to razor clams.

(Senate Bill No. 836. Senator Beban.)

The bill adds section 628*i* to the Penal Code and allows the use of Chinese shrimp nets in district 13, which is that part of San Francisco Bay lying south of a line drawn from Hunter's Point to the north end of Bay Farm Island. It provides that all shrimp, fish, or shell fish not suitable for sale as fresh shrimp, shall be returned to the water alive. Section 628 of the Penal Code prohibits the drying of shrimps or the possession of dried shrimps in the State. Until four years ago, Chinese shrimp nets were allowed and it was lawful to dry shrimps but unlawful to export them. It was found impossible to enforce the non-export law and the drying of shrimps was carried on on a large scale on San Francisco and San Pablo bays. Nine-tenths of the total catch were dried, the shrimp meats extracted, and the young fish and shrimp shells sold for fertilizer. Great quantities of young fish were very frequently taken with the shrimps and this destruction was especially great in upper San Francisco Bay and San Pablo Bay, and was caused in most cases by the boats taking shrimps for drying only. The boats fishing for the fresh shrimp market operated in deeper water so as to take the larger shrimps and in consequence they took fewer small fish. But the boats operating for fresh shrimps in the upper bay, while they did not take so many fish, they did take the young of the more valuable food fish, especially young smelt and striped bass. The boats operating in South San Francisco Bay, although they took shrimps only for drying, did not destroy many fish, and what they did take were of unedible varieties.

After a thorough investigation, the Chinese nets were abolished four years ago and it was expected some less destructive method of taking shrimps would be devised, but such has not been the case, and our markets have been for the most part without shrimps.

In re-districting the State it was possible to set aside the south end of San Francisco Bay for the use of these nets, where it has been shown their destruction to young fish is slight and such fish as are taken are mostly of unedible varieties. While it was not possible to stop the export of dried shrimps before, it will be an easy matter to stop the drying under the present law. With shrimp drying stopped, the shrimp industry is not likely to be more than one-tenth as large as four years ago.

(Senate Bill No. 830. Senator Flint.)

This bill changes only the season on golden trout; the other provisions in section 633 of the Penal Code which relate to golden trout remaining the same. It makes the season open on the first day of August instead of the first day of June, thus making the season open two months later; and the season closes on the first of October instead of the first of September, which makes a month longer open season in the fall.

(Senate Bill No. 852. Senator Gerdes.)

Amends section 630*a* of the Penal Code so as to require wholesale dealers and handlers of fish to render a monthly statement to the Fish and Game Commission, setting forth the amounts and varieties of fish they have received or caught. This law will greatly facilitate the collection of accurate statistical data upon which to base protective legislation.

(Senate Bill No. 972. Senator Flint.)

This bill amends section 636½ restricting the use of the paranzella or trawl net in the waters of the State of California. It does not abolish the use of these nets, however, but simply keeps them outside of the three-mile limit, thus keeping them away from shallow water, bays and lagoons, where certain fish are known to spawn and the young of different species congregate.

In confining these nets to the deeper waters the destruction of unmarketable fish is minimized to a great extent. It would not be proper to abolish these nets altogether as they can operate in the deeper water off shore where other nets cannot be used and they take fish that otherwise would be entirely lost to us. They furnish the markets with large quantities of fresh sole, sand-dabs and flounders at a moderately low price and tend to lower the price of the scarcer fish to the consumer.

(Senate Bill No. 973. Senator Flint.)

The bill amends section 636 of the Penal Code, dealing with nets and lines. The more important changes and additions are: The use of trammel nets in district 17 (Monterey Bay) is stopped. It has been found that these nets are frequently quite destructive to undersized crabs and that twenty per cent or more of the fish taken in them are rendered unfit for food by the hag fish, an eel-like fish that enters the mouth or gill openings of the fish and eats the contents, leaving only the skin and bones. The trammel nets are allowed in districts 18 and 19 where in the present law they are not allowed within one mile of the shore. A minimum mesh of eight inches is provided. Trammel nets have been allowed in the south because under another bill the paranzella and trawl nets have been eliminated in those waters and the trammel net is the only net to take their place. They are allowed inside the one-mile limit, for that is the only place they can be successfully operated. All told they are a very much better net for inshore fishing than the paranzella or trawl nets. Under a strict interpretation of the present laws the use of crab nets and lobster traps is illegal. The bill makes their use lawful. The bill provides for the use of "diver" gill nets in modified form. It has been found that for several of the "drifts" on the Sacramento the present law forbidding the use of diver nets is too severe. By allowing these nets to be submerged twelve feet and no more it will give the drifts a show at the salmon and striped bass, but will not permit of the former bad feature, where several nets at all depths passed over a drift taking all the fish before them. Recently some severe Federal regulations have been imposed on nets in the Sacramento and San Joaquin rivers and in the bays below, on account of their interference with traffic. If diver nets can be used the boats can pass over them without their being raised. Beach nets are eliminated in most of the State. Their restricted use is provided for only where it seemed necessary in order not to cripple any of the fisheries. The beach nets are very destructive to young fish in the shallow water where such nets are usually drawn ashore and their use should be stopped wherever it is possible to use other kinds of nets. The fishermen can continue to use them in district 19 for smelt only and during the months of September to January, inclusive. They will also be used in districts 9, 11 and 13 where they are the only method now employed in taking bait for the rock cod fisheries. Fyke nets without wings will be allowed in district 12 with a 2½ inch minimum mesh. Under the present law fyke nets are not allowed in the Sacramento River.

A provision is added to the section by which the Fish and Game Commission can recover fish from isolated ponds left by receding flood waters or to allow fishermen to take them where otherwise they would be a total loss. Another paragraph provides for the sale of condemned legal nets. The bill prohibits the use of nets for taking fish, mollusks or crustaceans in districts 1, 2, 3, 4, 14, 20, 23, 24, 25, 26, 27, 28 and 29.

(Senate Bill No. 975. Senator Flint.)

The bill amends section 628*a* of the Penal Code, and that part of section 634 pertaining to striped bass and shad has been added to it, making it exclusively a striped bass and shad section. The open season in the bill is extended to September 25, which is five days later than the present law. The season for salmon in another bill has been extended to September 25 to conform with striped bass and shad as the three species are running in the Sacramento and the San Joaquin at about the same time and it has been found by experience that the season for each should conform. A uniform mesh has been established for the three species for the same reason. The mimimum mesh is made 5½ inches, which is as small as it can be used and not take bass under the minimum limit, which is three pounds in weight. During the close season for nets, five striped bass per day may be taken with hook and line and during any day of the year five striped bass under three pounds in weight may be taken but may not be shipped or sold. The minimum sale limit remains at three pounds. During the open season for nets, there is no limit for hook and line except the limit for the "undersized" bass. The Saturday and Sunday close season remains as before, as does also the non-export clause.

(Senate Bill No. 1268. Senator Campbell.)

The bill amends section 642, defining the duties of the Fish and Game Commissioners. It makes it their duty to enforce the State laws for the preservation of wild mammals, wild birds, fishes, mollusks, crustaceans and all other forms of aquatic animals and plants. instead of just fish and game as at present. To enable the deputies to better enforce the laws it gives them the right of search, except the clothing actually worn by a person. In other respects the section remains the same.

(Assembly Bill No. 166. Assemblyman Lyon.)

This bill adds a new act to the Penal Code, which prohibits the operation of any kind of a net or seine, except a bait or dip net, within 750 feet from any pier, wharf or jetty in fish and game district 19.

The intention of this bill is to benefit the anglers who fish from the piers along the southern coast.

(Assembly Bill No. 1001. Assemblyman Lyon.)

Amends section 628*e* of the Penal Code. It confines the protection given California whiting, yellow-fin and spot-fin croaker to district 19, the present law being for the State. The bill also provides for the non-sale of these fish in the State.

It also provides a four-pound minimum sale limit for California halibut, a minimum sale limit of 18 inches for barracuda and a minimum weight limit of six pounds for albicore. These weights and size limits have been considered quite essential in the way of conserving these important food fishes and have been recommended by the fish dealers and fishermen of the southern coast.

(Assembly Bill No. 1533. Assemblyman Ream.)

This bill amends section 637 of the Penal Code which relates to fish ladders. It provides for a sufficient flow of water through the fishway or through or around the dam to allow for the passage of fish or to prevent the destruction of fish below the dam by cutting off the entire flow of water. The bill also provides for a hearing of the owners or parties concerned.

RECENT GAME LEGISLATION.

By Harold C. Bryant.

All hunters and those interested in the conservation of wild life in the State will be interested in the following bills relating to game birds and mammals which were passed by the last legislature and signed by the Governor. All in all, these measures are favorable to game conservation. Only a very few bills consistent with a program of conservation were crowded out, whereas a large number of bills inconsistent with this program were buried in the committees.

Senate Bill No. 1268 amends section 642 of the Political Code. It defines the powers of the Fish and Game Commission and makes it their duty "to see that the laws for the protection and preservation of wild mammals, wild birds, fishes, mollusks, crustaceans, and all other forms of aquatic animals and plants are strictly enforced." Heretofore there has been some doubt as to the legality of the interest taken by the Commission in other than game fish, birds and mammals. This bill also makes it the duty of the Commission to inspect all places where fish and game is held for sale or storage.

One of the most important bills passed was that which prohibits the use of "any animal, or imitation thereof, as a blind" for the purpose of approaching any wild bird, with a view to shooting it or killing it. Although such a law, for several years, has been in force with regard to ducks, yet the killing of geese in this manner has not been prohibited; and hence many market hunters have been able to escape conviction by claiming that they were "bull hunting" for geese when in reality they were hunting ducks. This bill means the death of "bull hunting" in California. (See fig. 39.)

Several bills were passed making the California laws protecting wild-fowl correspond with the new Federal Migratory Bird Law. Hence the open seasons on wild-fowl are now the same as those provided for in the Federal Migratory Bird Law, and all shore birds, with the exception of the Wilson snipe, black-breasted plover, golden plover, and yellowlegs, are protected the year round.

The open season on valley and desert quail (October 15 to December 31) has been made to more nearly correspond with the open season on ducks in order that there will be no excuse for a man to carry a gun during the close season on most game birds. With the increased number of hunters, uniformity in game laws becomes more and more necessary.

The open season on cottontail and bush rabbits is the same as that for valley and desert quail. This act provides that rabbits may be killed at any time by the owner or tenant of premises and by those authorized in writing by the owner or tenant. This, therefore, will give protection to the man who is suffering from the depredations of rabbits.

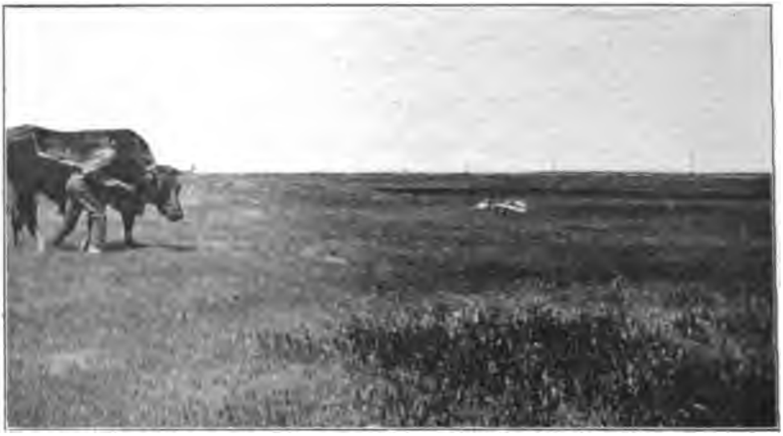

Fig. 39. "Bull hunter" working up a shot. A law will go into effect on August 1 which will prohibit all hunting of this kind. In former years it has been possible for a market hunter with the aid of a steer as a blind to slaughter over two hundred ducks or geese with just two shots from a large bore gun.

A tendency toward uniformity in seasons is also to be noted in the new law on doves which provides for the same season (September 1 to November 30, inclusive) throughout the State. The summer open season has allowed the killing of doves during the breeding season, for they breed throughout the summer. The new law will, therefore, prevent the destruction of many nestlings heretofore left to starve because of the death of their parents who were killed "according to law."

Much improvement on the laws relating to deer is to be seen. The killing of spiked bucks is now prohibited. "Any male deer with straight unbranched horns, or antlers, shall be considered a 'spiked buck.' " The following provision is also made in the same law: "Every person taking or killing any deer must retain in his possession, during the open season, and for ten days after the close of the open season, the skin and portion of the head bearing the horns, and must produce this upon the demand of any officer authorized to enforce the fish and game laws." The open seasons on deer have been placed later in the year, thus guarding against the possibility of destroying deer while their horns are still in the velvet. Under the law now in force the season opens much too early.

Bag limits on most species have been considerably reduced. Senate Bill No. 971 provides bag limits as follows:

Ducks, geese (except honkers and black sea brant), 25 per day, 50 per week; honkers and black sea brant, 12 per day, 24 per week; quail, shore birds, 15 per day, 30 per week; doves, 15 per day; mountain quail, 10 per day, 20 per week; grouse, sage hen, 4 per day, 8 per week; cottontail, bush rabbits, 15 per day, 30 per week.

In the districting bill, provision for a number of new game refuges is made. Certain areas are designated to constitute fish and game districts, and the killing of wild birds or mammals in these districts is prohibited. The only exception to the total prohibition of hunting in these refuges is to be found in district 28 (see fig. 38), where the killing of water-fowl is allowed. This exception was made because the Bear Valley Lake region constitutes the only duck grounds in southern California that are still open to the general public. Provision is made for the killing of predatory species in all of the refuges by securing written permission from the Fish and Game Commission.

Attempts to make longer seasons and larger bag limits on many of the game species, and the attempt to place meadowlarks, blackbirds and robins in the list of game birds met with failure.

BOOKS AND PAMPHLETS RELATING TO CALIFORNIA BIRDS.

The following list of books and pamphlets treating of California birds has been prepared as a help to teachers and others attempting to become better acquainted with the birds of this State. If you have no immediate need for the list, recommend it to your friends, and above all preserve it for future reference.—H. C. Bryant.

Books.

The following books can be obtained at book stores:

Bailey, F. M.
1914. Handbook of birds of the western United States (4th ed. revised, Houghton, Mifflin Co., Boston and N. Y.), li. 1–570, 36 pls., 2 diagrams, 601 figs. in text. Price $3.50. (The best handbook on western birds; contains good keys to the species).

Finley, W. L.
1907. American birds (Chas. Scribner's Sons, N. Y.), xvi, 1–256, 127 figs. in text. Price $1.50. (General account of habits of many western birds; suitable for general reading).

Myers, H. W.
1913. The birds' convention (Out West Magazine, Los Angeles, Cal.), pp. 1–81, 36 figs. in text. Price 75 cents. (Excellent for use as a supplementary reader by the grammar school teacher.)

Keeler, C.
1907. Bird notes afield (2d ed., Paul Elder and Co., S. F.). ix, 1–226, 16 pls. Price $2.50. ("An introduction to familiar birds in their native haunts"; keys and descriptions of birds in appendix).

Payne, H. T.
1913. Game birds and game fishes of the Pacific Coast (News Pub. Co., Los Angeles), pp. 1–186, many unnumbered plates. Price $1.50. (Written from standpoint of a practical sportsman and angler; treats of game birds only; not scientifically accurate.)

Torrey, B. B.
1913. Field days in California (Houghton, Mifflin Co., N. Y.). 12, 235, 9 pls. Price $1.50. (Personal reminiscences; many references to the habits of California birds. Thoroughly accurate, and reliable; good style).

Wheelock, I. G.
1904. Birds of California (A. C. McClurg & Co., Chicago). xxviii, 1–578, 87 figs. in text. Price $2.50. (An account of California birds interesting to the amateur but not scientifically dependable.)

Pamphlets.

The following bulletins and circulars giving details as to food habits of birds. can be obtained free by applying to your congressman at Washington, D. C., or at a slight cost from the Superintendent of Documents, Washington, D. C.

Beal, F. E. L.
1904. Some common birds in their relation to agriculture. United States Department of Agriculture, Farmers Bulletin 54, pp. 1–48, 22 figs. in text. (Food habits of many California birds.) 5 cents.
1904. The relation of birds to fruit growing in California. U. S. Dept. of Agric., Annual Report, 1910, pp. 241-254. 5 cents.
1907. Birds of California in relation to the fruit industry. Part I, U. S. Dept. Agric., Biological Survey Bulletin 30, pp. 1–100, 5 pls. 20 cents.
1910. Birds of California in relation to the fruit industry. Part II, U. S. Dept. Agric., Bur. Biol. Surv. Bull. 34, pp. 1–96, 6 colored plates. 40 cents.

Beal, F. E. L. and McAtee, W. L.
1912. Food of some well-known birds of forest, farm, and garden. U. S. Dept. Agric., Farmers Bulletin 506, pp. 1–35, 16 figs. in text. (Many references to food of California birds.) 5 cents.

Bureau of Biological Survey.
1913. Fifty common birds of farm and orchard. U. S. Dept. Agric., Farmers Bulletin 513, pp. 1–31, 50 colored figs. in text. (Beautifully illustrated in color; partly applicable to western birds.) 15 cents.

Educational Leaflets.
Published at intervals in Bird Lore by the National Association of Audubon Societies. (Popular accounts of many birds.) Separates obtainable from Secretary Audubon Society, New York City, at 5 cents each.

Miscellaneous.

Libby, G.
1912. Bird study in the public schools. California Fish and Game Commission. Bulletin 2, 1–48, 2 figs. in text. (Helpful to teachers; obtainable from Fish and Game Commission, San Francisco. Supply nearly exhausted.)

Bryant, H. C.
1912. Birds in relation to a grasshopper outbreak in California. University of California Publications, Zoology 11, pp. 1–20. (Shows value of birds as insect destroyers. Obtainable from the University of California Press, Berkeley, California.) Price 20 cents.
1914. A determination of the economic status of the western meadowlark. Univ. of Calif. Publ. Zool, 11, pp. 377–510, pls. 21–24, 5 figs. in text. (Detailed account of food of western meadowlark. Obtainable from University of California Press, Berkeley, California.) Price $1.25.

Local Lists of Birds.

The following faunal and local check-lists of California birds, published by the Cooper Ornithological Club, may be obtained from W. Lee Chambers, Eagle Rock, California.

McGregor, R. C.
1901. A list of the land birds of Santa Cruz County, California, Pacific Coast Avifauna, 2, pp. 1-23. Price 25 cents.

Grinnell, J.
1912. A systematic list of the birds of California. Pacific Coast Avifauna. 8, pp. 1-23. (A check-list only.)

Willett, G.
1912. Birds of the Pacific slope of southern California. Pacific Coast Avifauna, 7, pp. 1–122. Price $1.50. (An annotated check-list.)

TYLER, J. G.
1913. Some birds of the Fresno district, California. Pacific Coast Avifauna, 9, pp. 1–114. Price $1.50. (Applicable to greater part of the San Joaquin-Sacramento Valley. Annotated check-list.)

The following may be secured from the University of California Press, Berkeley, California:

GRINNELL, J.
1908. The biota of the San Bernardino Mountains. Univ. of Calif. Publ. Zool., 5, pp. 1–170, pls. 1–24. (An account of the flora and vertebrate fauna to be found in the San Bernardino Mountains of southern California. Birds are treated at length.) Price $2.00.

1914*a*. An account of the mammals and birds of the lower Colorado Valley, with especial reference to the distributional problems presented. Univ. of Calif. Publ. Zool., 12, pp. 51–294, pls. 3–13, 9 figs. in text. Price $2.40.

1914*b*. A second list of the birds of the Berkeley Campus. Condor, 16, pp. 28-40. (Gives local distribution, status and dates of occurrence; obtainable from Museum of Vertebrate Zoology, Berkeley, California.)

GRINNELL, J., AND SWARTH, H. S.
1913. An account of the birds and mammals of the San Jacinto area of southern California, with remarks upon the behavior of geographic races on the margins of their habitats. Univ. of Calif. Pub. Zool., 10, pp. 197-406, pls. 6–10. Price $2.00.

Ornithological Periodicals.

THE CONDOR.
Bimonthly. Official organ of the Cooper Ornithological Club. W. Lee Chambers, Business Manager, Eagle Rock, California. Price $1.50 a year. (Illustrated magazine of western ornithology; the best bird magazine for those interested in California birds.)

THE AUK.
Quarterly. Official organ of the American Ornithologists' Union. Jonathan Dwight, Jr., Secy., 134 W. Seventy-first street, New York City. Price $3.00 a year. (Rather more technical than popular; treats of North American birds.)

BIRD LORE.
Bimonthly. Official organ of the National Association of Audubon Societies. Bird Lore, Harrisburg, Pennsylvania. Price $1.00 a year. (The best popular bird magazine published in the United States; suitable for school work; has nature-study department.)

N. B. For further bibliographical references to California birds, previous to 1908, see Grinnell's "A Bibliography of California Ornithology," (Pacific Coast Avifauna, 5, pp. 1-166), procurable from W. Lee Chambers, Eagle Rock, California. Price $1.50.

CALIFORNIA FISH AND GAME

A publication devoted to the conservation of wild life and published quarterly by the California State Fish and Game Commission.

Sent free to citizens of the State of California. Offered in exchange for ornithological, mammalogical and similar periodicals.

The articles published in *California Fish and Game* are not copyrighted and may be reproduced in other periodicals provided due credit is given the California Fish and Game Commission. Editors of newspapers and periodicals are invited to make use of pertinent material.

All material for publication should be sent to **H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, California.**

July 15, 1915.

"It is true that the game belongs to the people; but this rightly means the people who are to be born a hundred years hence just as much as the people who are alive today." — Theodore Roosevelt.

WHAT THE BUREAU OF EDUCATION, PUBLICITY AND RESEARCH HAS BEEN DOING.

EDUCATION.

1. Lectures.—A number of illustrated lectures on the following subjects have been given in different parts of the State:

The non-sale of game.
The economic value of birds.
Common birds of California.
The duck breeding grounds of California.
The scientific basis of bird protection.
Methods of game conservation.
The food of common birds.
The food habits of the roadrunner in California.

In addition a series of lectures was given in a course in Advanced Vertebrate Zoology in the University of California during the past semester, the students in which are prospective teachers, and also a series of lectures on game and game conservation was given to forestry students in a course on forest protection.

2. Nature Study.—An attempt has been made to stimulate the teaching of nature study in the public schools.

3. Bulletins.—*California Fish and Game* a quarterly illustrated magazine with the motto "Conservation through education," has been edited and published.

4. Correspondence.—Many inquiries regarding birds and mammals of the State, game laws, etc., have been answered.

PUBLICITY.

1. A series of articles under the general heading "Game Resources of California," has been published in the *San Francisco Call and Post*. The articles have been regularly reprinted in about twenty other newspapers in the State.

2. Newspaper items giving publicity to the work of the Fish and Game Commission and to game and game conservation have been issued.

3. Certain editorials and articles in *California Fish and Game* have given publicity to the work of the Commission.

RESEARCH.

1. Considerable data has been collected regarding the life histories and status of game birds and mammals.

2. Photographic evidence of the work of the Commission and the status of game has accumulated.

3. Food habits of the roadrunner. Eighty-three stomachs of roadrunners have been microscopically examined and the contents tabulated. A complete report on the food habits of this bird in California is nearing completion.

4. Food of ducks. A large number of stomachs of ducks have been examined and the contents identified. A number of stomachs are still at hand awaiting examination.

5. Data relative to the past and present abundance of fur-bearing mammals in this State has been procured. An investigation of the laws on fur-bearers in force in other states has also been made.

6. The breeding grounds of ducks in Alameda and Merced counties have been investigated and censuses taken. The carrying capacity of a small area of marsh near Los Banos, Merced County, is being worked out by systematically taking censuses of the breeding birds.

7. A comparison of the California Fish and Game Commission with the commissions of other states is under way.

8. Circular letters are being sent to deputies to ascertain the present status of

the ring-necked pheasant. A full report will be prepared.

NEW LEGISLATION.

Your attention is called to articles appearing in this issue which give a short resume of the new legislation regarding fish and game. We are glad to report that practically all of the laws relating to fish and game which were passed by the legislature and signed by the Governor are measures which will do much towards conserving the wild life of the State. The new laws go into effect on August 7. A revised book of "California Fish and Game Laws" and game cards will be available before this time.

WHAT IS THE FUTURE OF GAME IN CALIFORNIA?

The optimist is considered a desirable citizen, but too often the knowledge on which an optimist bases his views is insufficient or one-sided. Were the unbiased or scientific attitude more prevalent, there would be less harm done to worthy causes. A case in point: The optimist maintains that game in California is increasing. He encourages all of his friends to think the same. Hence very few realize the importance of more stringent laws. On the other hand, the man with the scientific attitude attempts to collect all possible information regarding the past and present status of game in the State and finds the following facts:

1. That in spite of more game laws, shorter seasons and smaller bag limits, practically every species has decreased in numbers in the last twenty years.
2. The concentration of game into small areas makes the present numbers appear far greater than they should.

The scientist does not, therefore, depend upon hearsay evidence. He bases his conclusions upon a comparison of censuses taken by dependable observers and attempts to base his evidence on *facts*.

There is not a person interested in conservation in California who would not subscribe to the scientific viewpoint which emphasizes the necessity of obtaining *facts* and basing conclusions on absolute evidence. It is extremely necessary that this particular point of view should be applied to all problems connected with the conservation of game. It is to be hoped that future generations will be so trained that they will continually assume this attitude rather than that of many present-day hunters who are attempting to hoodwink people into the belief that game is increasing in order to attain their own selfish ends. The optimist as a member of society is extremely valuable, but may not his conclusions be at times misleading?

NEED FOR ACCURATE INFORMATION

Few of our readers probably appreciate the great need of accurate information regarding those species of birds in which we are particularly interested. It is the lack of just such information which makes estimates as to the past and present abundance of certain species impossible at the present time. Since increased cultivation is going to make statistical information of still greater importance in the future, every opportunity should be taken to accumulate data regarding our game birds and mammals. Professor Spencer F. Baird, one of the early governmental biologists, made this statement a number of years ago: "Accurate statistical information is the one essential foundation upon which protective legislation must rest." If this sentence was a true statement of fact a number of years ago when it was written, it is certainly a still more important statement of fact at the present.

It is unfortunate that many of the men in the best position to furnish accurate information, are men who fail to realize the true value of such information and who seldom take the trouble to write down what they see.

A scientific record of occurrence or of the nesting of some bird is made up of four parts as follows:

1. Name of species or accurate description of bird.
2. Date of observation.
3. Exact locality of observation.
4. Name of observer.

If you wish to take an active part in game conservation, there is hardly a better method than to systematically collect accurate information as to abundance, habits, and breeding of our game birds and mammals. Will you not record in a notebook the observations which you believe will be of interest and report them to the Bureau of Education, Publicity, and Research of the California Fish and Game Commission? Here the data will be carefully filed and its accumulation will become increasingly valuable.

The Bureau of Biological Survey is attempting to obtain a census of the birds of the United States for the purpose of ascertaining approximately the number and relative abundance of the different species. This exact information is to be used as a basis for determining the adequacy of the present laws for bird protection and whether the several species are increasing or diminishing. The census will need to be repeated for several years before safe generalizations can be made therefrom. Instructions and report blanks are furnished to all those who will volunteer their services in this work. Bird observers in the west and south are particularly requested to cooperate as these facts have not been sufficiently covered in past observations. A census of the game birds breeding in your particular vicinity will be of exceedingly great value to the Bureau of the Fish and Game Commission having this work in charge and also to the United States Department of Agriculture.

LECTURES ON GAME CONSERVATION GIVEN FORESTRY STUDENTS

The Bureau of Education, Publicity and Research has been successful in establishing a course of lectures on game conservation to be given to forestry students in the University of California. The course this past semester was given in connection with the regular course in Fire Protection in charge of Assistant Professor Woodbridge Metcalf. Six lectures were given in the course from April 5 to 16, 1915, as follows:

1. California Birds and Mammals, by Dr. H. C. Bryant, Game Expert, California Fish and Game Commission.
2. The Economic Value of Birds, by Dr. H. C. Bryant.
3. Mammals in Their Economic Relations, by Dr. H. C. Bryant.
4. The Food and Game Fishes of California and Their Conservation, by N. B. Scofield, in charge Department of Commercial Fisheries, California Fish and Game Commission.
5. Past, Present and Future of Game in California, by Dr. H. C. Bryant.
6. Why and How to Conserve California's Wild Life, by Dr. W. P. Taylor, Curator of Mammals in the University of California Museum of Vertebrate Zoology.

As all forestry men in California, by virtue of their position, become deputy game wardens, these lectures will be of service in developing interest and in affording training to those who will later necessarily become guardians of California's wild life. It is very important that all forestry students be taught to recognize at sight the different species of game fish and animals, the economic value of each and the means by which they can be conserved. In addition there is an intimate relation between the two great natural resources—forests and wild life. Each is dependent more or less on the other. Every forest conservationist should have complete knowledge as to the value of birds as protectors of forests due to their destruction of insect pests. And every game conservationist should realize that with the increase of the number of forests there is an increase in game. Co-operative work such as this planned between the State Forestry School and the Fish and Game Commission will help to properly develop the men to whom the administration of our forests and game will ultimately be intrusted.

Plans are now under way to make this co-operative work permanent. Next year a similar course of lectures will be given in one of the regular courses in forestry. At the present time there are not more than one or two universities in the United States which attempt to give a course of training to those who desire to take up the work of a game warden. A short course of lectures such as that given this past year can not be expected to furnish a man with the information necessary to make him an effective game warden. It is to be hoped that interest along this line will so increase that before many years a regular course of training for game wardens will be obtainable at our State University. Should the University of California be far-sighted enough to take up this work it would be a pioneer in the field and doubtless would draw a large number of students from other states. The days are past when political pull was alone needed for obtaining a position as deputy. The demand is now for trained men. This demand is growing, and to meet it some university will have to establish the proper courses of training.

NATURE STUDY IN THE PUBLIC SCHOOLS.

Although nature study is a compulsory subject in our public schools there are few places where any pretense of adequately teaching this subject is made. In fact, there is little wonder that this should be the case, for there are very few universities and colleges in the United States which give the proper training to the teacher who desires to specialize in nature study work. Cornell University has made an enviable reputation for itself by emphasizing nature study and many of our best teachers of this subject are graduates of this institution. Interest is growing, however, and it will not be long before there will be a demand for teachers equipped for this sort of work.

A few of the larger cities in this State have nature study supervisors, and consequently the work is organized. In many other places no attempt whatever has been made to meet even the law requirement. When teachers are asked to take up nature study work they either complain that they have not had the training which would enable them to properly conduct the work, or that no material is available. That there is a basis for this last complaint, let it be known that about the only attempt to furnish teachers of this State with proper material has been the publication of a "Bird and Arbor Day" bulletin by the Superintendent of Public Instruction and the publication of a bulletin entitled "Bird Study in the Public Schools" and a series of leaflets for teachers by the California Fish and Game Commission.

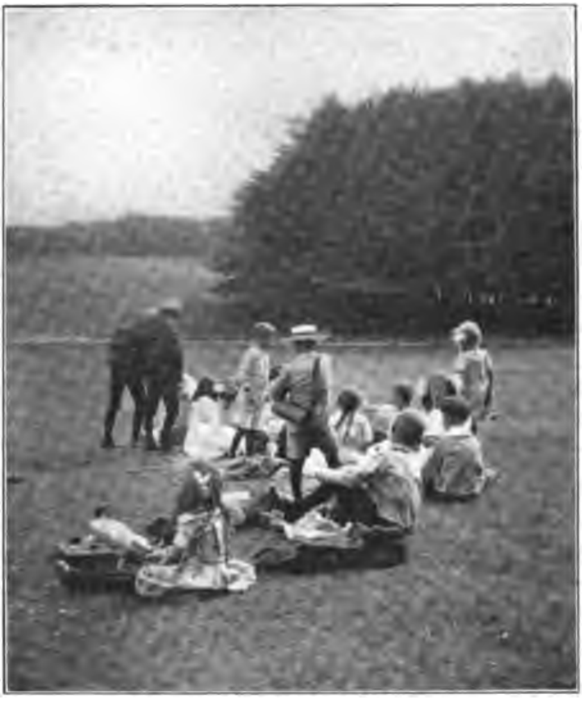

Fig. 40. A group of yellow-haired, blue-eyed Danish children learning the beauties of their native wild life. The field excursion is a fixed institution of many European countries. (Photograph by C. M. Goethe.)

The most needed method in the teaching of nature study is the institution of the field trip. Children should be taught to "read a roadside in the same way in which they read a book." More can usually be learned from the school of out-of-doors than from the usual methods in vogue in our public school system. In Europe they have long emphasized the field trip, and it is not an unusual sight to see teachers with their classes visiting the outskirts of the city to study wild life first hand. (See fig. 40.)

In order to stimulate work along this line (which gives one of the best chances for education in wild life conservation), the Director of the Bureau of Education, Research and Publicity of the California Fish and Game Commission has been conducting several field trips in Sacramento. (See figs. 41 and 42.) Classes of fifth-graders have been taken to the city parks and to the outskirts of the city and have been taught the names and habits of the different forms of life encountered. As a result of this work, which was inaugurated through the efforts of Mr. C. M. Goethe, there is every hope that the field trip will become a permanent institution in Sacramento. It is to be hoped that many of the other larger cities in the State will become convinced of the value of this type of education and will institute similar work.

The lack of the proper training which is acknowledged by so many teachers in this State, should be corrected. Each one of the normal schools should offer courses designed to prepare teachers for teaching nature study and in addition the universities should provide a similar training.

This Bureau is planning to furnish teachers throughout the State with the proper sort of material for teaching game conservation along with nature study in the public schools; for no better foundation for permanent game conservation can be laid than that to be found in the proper teaching of the youth of the State.

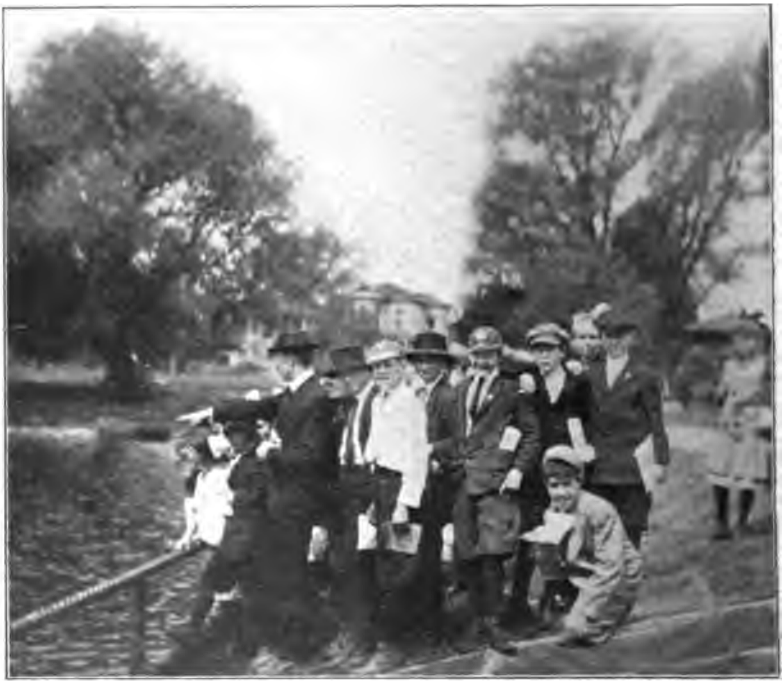

Fig. 41. Fifth-graders of Sacramento being taught the fundamentals of game conservation at Southside Park, where many waterfowl are to be found on the lake.

THE NATIONAL FORESTS AND WILD LIFE

There recently appeared in *Recreation* (May, 1915), an article under the title "The National Forests and Wild Life," by Henry S. Graves, Chief Forester, United States Forest Service. We believe this to be one of the best contributions to conservation literature which has appeared in recent years. Mr. Graves shows his breadth of vision by championing wild life conservation as well as forest conservation. He also shows that his interest goes beyond his immediate duties, for he seeks ways and means of widening the scope of forest conservation.

The following extracts from this excellent article will give a better idea of the worth of the contribution than any words which we can say:

"Forests are more than trees: they are rather land areas on which are associated various forms of plant and animal life. The forester must deal with all. Wild life is as essentially and legitimately an object of his care as are water, wood and forage.

"Conservation means simply intelligent forethought in the collective interest. The wild life question can be settled aright only by adopting as the guiding principle that there shall be realized the largest net total of public benefits.

"I look to the time when the wild life of the National Forest may be handled on sound principles of constructive development and use, such as now characterizes the management of the timber, forage, water and land resources. Such an administration would take account of the general needs of the public, the carrying capacity of the land that can be devoted to game, the needs of individual species and individual forests, the coordinating of game administration in different localities and states, the use of the increment, and the intelligent adjustment of wild-life control to the economic use of other sources.

"The first step required in the creation of game refuges is 'a survey of the situation through a game census combined with a determination of the areas most suitable for use as game breeding and

Fig. 42. A class of Sacramento school children on a field excursion. They are being taught "to read the roadside as they are taught to read a book."

feeding grounds.' The next step is a 'knowledge of the habits and requirements of the various kinds of game, the relative adaptability of different areas for the various species, and the carrying capacity of each area when fully stocked.'

"There must be some means of taking care of the natural increase of game after a certain point is reached. Hence any policy of wild-life protection as applied to game animals must sooner or later be accompanied by hunting as a practical necessity.

"The wild life resource is not being properly developed. Present conditions make its handling haphazard, unintelligent, ineffective and inadequate."

We can not help but add this word of appreciation of the work of the forest service in the State of California. The California Fish and Game Commission has always found the administrative officers to be ready and willing to co-operate in every way with the work of the Commission. They have been willing that forest rangers should become deputies of the Fish and Game Commission. They have allowed rangers to make detailed reports as to the status of wild life on their ranges. They have requested that rangers enforce the game laws wherever possible. The rangers themselves have been instrumental not only in enforcing game laws by prosecuting violators, but in attempting to educate people to the need for game conservation.

Recently they have shown their interest in the Commission's work by strongly advocating the setting aside of large portions of some of the national forests in this State as game refuges.

Hence, the attitude taken by Mr. Graves seems to permeate the whole forest service. Such a body of trained men as compose the forest service united in a strong organization is and will be an important factor in bringing about the proper administration of game.—H. C. B.

CRUDE OIL—A TRAP FOR BIRDS.

Near one of the pumping stations of the Associated Oil Company located at Brito, Merced County, California, there is a large reservoir filled with crude oil. This has proved a trap to many hundreds of birds. The pond is about 50x150 feet and the shining surface of the oil probably appears to the birds flying at night as a pond of water. The moment a bird's feet touch the sticky oil the bird is entrapped, for each successive effort to free itself with its wings only fastens it deeper into the oil. A trip to the pond on May 11, 1915, showed the mummied bodies of at least three hundred birds. In addition along the shores of the pond there was an incrustation several inches deep made up of feathers and bones of birds.

Almost every species of water bird in that vicinity seems to have been entrapped in this oil pond. Examination showed specimens of the following birds identifiable: canvasback, spoonbill, mallard. baldpate?, goose (species?), green-winged teal, cinnamon teal, mudhen, avocet, black-necked stilt, killdeer, least sandpiper, great blue heron, black-crowned night heron, egret, bittern, belted kingfisher, western meadowlark.

In a small puddle of oil about four feet in length were found six killdeer. The killdeer decoys easily, and doubtless the first bird entrapped decoyed the others to their death.

This circumstance furnishes additional evidence looking towards the solution of the problem confronting paleontologists as to the method by which the bones of prehistoric mammals have been deposited in such numbers in the asphalt of Rancho La Brea near Los Angeles. The incrustation of bones and feathers along the border of this oil pond would doubtless, in time, make similar piles of bones to those found in the asphalt. Hence the theory that many of the birds were entrapped in the oil and that many others met the same fate by being decoyed by those entrapped has much present day evidence to support it.

It is to be hoped that measures will be taken in the near future to prevent further catastrophes of this kind. Such a toll of bird life, and especially of such game birds as the ducks found in the pond, is reprehensible since it could easily be averted with small expense. The matter will be taken up with the Associated Oil Company in the hope that further destruction of wild life may be averted.

MORE GAME REFUGES FOR CALIFORNIA.

At the present time there is much interest shown in game refuges. Many reports come from the east telling of the establishment of chains of refuges throughout certain states. It should be understood by all Californians that our State is not behind in this particular regard.

The 1909 Legislature set aside the Pinnacles National Forest Reserve, situated in the counties of San Benito and Monterey, as a state game refuge. The legislature of 1913 made a large part of the Cleveland National Forest a game refuge. These two refuges taken together comprise many square miles of fine game country. During the past legislative session a successful attempt was made to make the Trinity National Forest a state game refuge and also a large part of the Angeles National Forest. These combined refuges occupy an area practically equal to that of the state of Rhode Island.

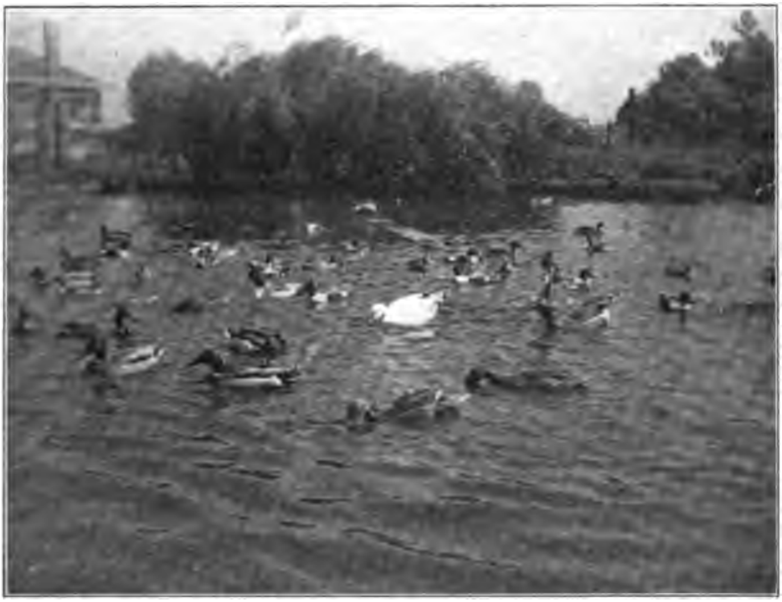

Fig. 43. Ducks and geese on a pond at the State game farm. Many of these ducks have nested on the grass-grown banks this past spring.

There are now 716,240 acres of national forest on which hunting, except for predatory animals, is prohibited.

A list of game refuges located on national forests in California follows:

Cleveland National Forest Refuge, 72,160 acres.

Pinnacles National Forest Refuge, 2,080 acres.

Trinity National Forest Refuge, 38,000 acres.

Angeles National Forest Refuge, 600,000 acres.

In addition there are several other state and federal refuges, the areas of which are not obtainable as most of them are unsurveyed. They are as follows:

Lake Merritt, city of Oakland, Alameda County.

Klamath Lake Bird Reservation, Siskiyou County.

Clear Lake Bird Reservation, Modoc County.

East Park Bird Reservation, Colusa County.

Farralon Bird Reservation, Farralon Islands off Golden Gate.

Big Basin Game Refuge, Santa Cruz County.

Nor should the national parks of this State, which are Federal game refuges, be forgotten for the Yosemite and Sequoia National parks cover thousands of acres.

Within the next few months over a hundred thousand acres will doubtless be set aside as game refuges under the law enacted in 1913, which provides that "any person, firm or corporation owning and in possession of patented lands in the State of California, embracing an area of not less than one hundred and sixty acres, may transfer by an instrument in writing, duly acknowledged before an officer authorized under the laws of this State to take acknowledgments, to the State of California, the right to preserve and protect all wild game on the land decribed therein for a period of not less than ten years." The California Fish and Game Commission has been slow to create such refuges for fear that individuals had a selfish motive in creating a reservation. Since the amendment of the law in 1913 changing the term of years to ten, the danger of promoting this sort of game reservation has been largely done away and the Commission has now under consideration several such propositions.

EARLY NESTING DATES OF DUCKS.

(Attention Deputies!)

It is remarkable how few definite records of the early and late nesting of ducks there are available. Just at the present time if more definite information were at hand California might be instrumental in influencing legislation opposing spring shooting. There is much controversy in the middle west as to the time of breeding and the time of nesting of ducks. Missouri has just passed a law allowing two open seasons on water-fowl—one in the fall from September 15 to December 31, and one in the spring from January 1 to April 30. Such a law in this State would allow the killing of many birds on their nests, as can be seen from a note on the nesting of ducks in the Alvarado marshes of Alameda County to be found in the Life History Notes on page 191. We trust that deputies and every one so situated that they are able to report the finding of the nests of game birds will do so, so that data may be on file in this office which will give dependable evidence as to the extent of the breeding seasons of our game birds.

FUR MARKET IMPROVES.

In spite of the fact that the European war has practically dropped the bottom out of the market for furs, yet some American furriers are advertising widely to obtain certain pelts. The greatest demand appears to be for coyote skins and the very best ones can now be sold for from $2.50 to $3.50. Low prices are quoted for practically all other common fur-bearing mammals. We are glad to see this improvement in the market and we trust that within a few years it will again be restored to normal.

FISH EXPERT TO EDIT "HATCHERY AND FISHERY NOTES."

With this number, the Hatchery and Fishery Notes in *California Fish and Game* will be edited by Mr. N. B. Scofield, in charge Department of Commercial Fisheries. Mr. Scofield's training and wide experience especially fit him for these new duties. A marked improvement in the general character of the material in this department is therefore to be expected.

THE PRACTICAL JOKESTER AGAIN.

The newspaper of a back-country town recently printed the following letter which, it was stated, had been received by a State Game Warden. We can not vouch for the authenticity of the letter, but we are sure that deputy game wardens have received letters just as provoking of smiles. This is the letter:

"Dear ser: I don't wan this sorter licents. I thot i was gettin' a Marridge licents, sumbudy sent me to mr. -------- and sed he would gimme a licents. mandy was so mad when i got back with this here hunten licents she would not have Me. she sed i didn't have sents anuff to git marridge licents so she ups and runs off with bill johnson and i Am in a hel of fixt. i want my muney back unless this hear licents will let me shoot bill johnson.

"yours most truly,

"SAM JACKSON."

CORRESPONDENCE RELATIVE TO "CALIFORNIA FISH AND GAME."

Owing to the fact that the California Fish and Game Commission has a number of district offices with one located at Sacramento, the capital of the State, there is often considerable misunderstanding as to where correspondence should be addressed. Attention is called to the note at the head of the editorial page, where the statement is made that all material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, California. It should also be understood that all communications relative to the quarterly magazine *California Fish and Game*, including requests for the periodical, should be sent to the same address or to the head office, 734 Mills Building, San Francisco.

HATCHERY AND FISHERY NOTES.

OUTPUT OF THE FISH HATCHERIES IN 1915.

The hatcheries of the State Fish and Game Commission are having one of the most successful years in their history. The take of trout eggs is approximately twenty-five per cent greater than any year in the history of the Commission. The hatcheries are running at the fullest capacity at which they can operate and still turn out the fish in the best of condition. Many more eggs could have been taken. Steelhead trout eggs were taken at the egg collecting stations on Scott Creek, Santa Cruz County, and at the Snow Mountain station on Eel River in Mendocino County. The eggs taken at Scott Creek are taken to the Brookdale Hatchery on San Lorenzo River where they are held in the hatchery until they have reached the "eyed" stage, so called from the fact that the eyes of the embryo fish at that time as seen through the walls of the egg, are the most conspicuous part of the fish. At this stage of their development they are known as "eyed" eggs and they will stand shipping for long distances, if properly packed. From Brookdale most of the eggs are shipped to the hatchery at Sisson, partly on account of the limited capacity of the Brookdale Hatchery and partly because they can be more economically hatched at Sisson where the pure cold water of the mountains makes a stronger and better fish. The steelhead eggs taken at Snow Mountain station are "eyed" and shipped to the hatcheries at Ukiah, Sisson, and Price Creek. Three hundred thousand eggs are being held at Snow Mountain and 750,000 at the Ukiah Hatchery. There will be steelhead fry to distribute in the State as follows: From the Sisson Hatchery, 6,490,000; from Brookdale Hatchery, 1,000,000; from the Ukiah Hatchery, 1,000,000, and from Price Creek Hatchery, 862,000.

On Lake Tahoe at Taylor Creek 3,500,000 eggs of the black spotted trout were taken and double this number could have been taken had there been room at the hatcheries. These eggs are being handled at the State hatcheries at Tahoe and Tallac. Three million of the eggs will be retained at these hatcheries, 350,000 shipped to Sisson and 150,000 to the hatchery at Bear Valley Lake, San Bernardino County.

Rainbow trout eggs have been taken on Bogus Creek and Camp Creek, tributaries of Klamath River and are being hatched at the Sisson hatchery, 3,295,000 of them.

From the Sisson Hatchery ponds 1,630,000 Lock Leven trout eggs and 1,075,000 eastern brook trout eggs have been taken.

For the first time in over twenty-five years the State is taking rainbow eggs from the Pit River country. One of the first State hatcheries was built on Hat Creek for the taking of salmon eggs but was soon discontinued. The old building still stands but it is in the direct line of the "mud" flowing from the Mount Lassen volcano. The State is taking its rainbow eggs this year on Burney Creek, a tributary of Pit River ten miles from Hat Creek. The run of rainbows on this creek is quite late and is just now beginning late in May. It is the intention to get a supply of these trout for the Sisson Hatchery ponds and to also find out the extent of the run on the creek.

The State is this year operating a hatchery on Bear Valley Lake, San Bernardino County. This lake is stocked with Klamath rainbow trout and the fish have the same appearance and are about the same size as the Klamath trout. Four hundred and fifty thousand eggs were taken and the hatchery will in addition receive 150,000 of the black spotted trout eggs from Lake Tahoe, all of which are to be distributed in the southern part of the State.

All of the trout enumerated above are to be distributed in the streams of the State and they will doubtless be instrumental in making excellent fishing in a couple of years.

The greatest activity of the hatcheries in California is the propagation of Chinook or Quinnat salmon. The California Fish and Game Commission and the United States Bureau of Fisheries carry on the work together, the United States Bureau operating the spawn-taking and "eyeing" stations and the State doing most of the hatching. Altogether approximately

40,000,000 salmon eggs were taken during the past winter by the bureau's stations on Mill Creek and Battle Creek in Tehama County, at Baird on the McCloud River and at Klamathon on the Klamath River. Part of the eggs were shipped to the Price Creek Hatchery to be hatched and the fry liberated in Eel River and Mad River. The greater part of the eggs, 30,000,000 of them, were hatched at Sisson for liberation in the Sacramento and Klamath Rivers. The balance were hatched at the Baird Hatchery and at the two stations on Mill and Battle creeks, and nearly all of these have been liberated in the Sacramento. At Sisson 5,000,000 of the fry were put in Klink's and Sisson lakes where they will be held until next fall and then allowed to enter and descend the Sacramento River. Last year 4,000,000 were held in these lakes until fall and in addition to the natural food which was there in abundance they were fed each day. They reached an average length of four inches and were a strong healthy lot.

It has been pretty well established that the majority of the adult salmon coming back to their parent stream are salmon that remained in the stream as fry during their first summer, notwithstanding the fact that the greater majority of the fry descend the river before their first summer. So it is becoming the policy to hold as many of the fry as possible through their first summer.

THE SPINY LOBSTER IN MONTEREY BAY.

Deputy Fish and Game Commissioner P. H. Oyer of Pacific Grove reports the finding of a spiny lobster in Monterey Bay near the town of Seaside. The lobster or crawfish as it is commonly called by the fishermen was taken in a trammel net in sixteen fathoms of water and was 13½ inches long and weighed 2¼ pounds.

About two years ago one hundred spiny lobsters were put in Monterey Bay where it was hoped they would live and propagate and increase in numbers, and by the aid of additional "plants" to eventually become of commercial importance. The spiny lobster is of considerable commercial importance in southern California but it has never established itself north of Point Conception. It has been believed by many that the spiny lobster would thrive in our northern waters if it could once be "planted" here; that the reason it is not here now is that there is some natural barrier past which it has not been able to come. The probable reason that it is not found north of Point Conception is that the temperature north of that point is too cold for the young or larval stage of the lobster at the hatching time. It may be found that there are a few places where the temperature is favorable enough to allow of its propagating, hence this experiment in Monterey Bay is of great interest and the question yet to be settled is whether they will be able to propagate. One of the Chinese fishermen at New Monterey thinks he found a lot of the young lobsters in a lead pipe which he recovered from the old wreck off Chinatown Point, but none of these young "lobsters" were saved. The point as to whether the spiny lobsters have actually spawned in Monterey Bay needs to be verified. The sheltered south side of the bay has been selected as the place in which they will be most likely to establish themselves. The large lobster found had about doubled its weight in the two years. —N. B. SCOFIELD.

STORM WRECKS FISHING BOATS.

The recent wind storm created havoc in the Monterey fishing fleet. The fishing boats were either sunk at their moorings or driven ashore where they were crushed and pounded to pieces by the surf. The buildings of the Sacramento River Packers Association were destroyed and the wreckage piled on the beach with the boats. The buildings are being rebuilt by the American Fish and Oyster Company, at a cost of $65,000. They will be in readiness for the salmon run which usually commences in the fore part of June. The American Fish and Oyster Company and the Western Fish Company will receive salmon at this plant and will prepare them for shipment fresh and will also tierce the larger fish.

The Sacramento River Packers Association will receive their salmon at the wharf and buildings of the Monterey Packing Company. They will ship salmon fresh and also tierce as in the past. The Monterey Packing Company are erecting a new building for the storage of tierced salmon and to hold part of the sardine pack. The building will contain a modern, well equipped ice plant.

Salmon are taken in Monterey Bay entirely by trolling. Gasoline power boats are principally used, but there are a few sail boats. Each boat trolls with two lines attached to bamboo outriggers. The fish are landed at the packing house wharf and dumped on the floor where they are sorted, and the smaller fish gutted, washed, and iced in boxes. From here they are shipped to different parts of the State, but principally to San Francisco, from which point many are reshipped. The larger fish are mild cured in tierces the process of which is roughly as follows:

The head is removed and the fish gutted and then split into two halves with the back bone removed. After being thoroughly washed and trimmed they are salted with as much salt as will cling to the wetted sides and packed down dry in large casks or tierces. When the tierce is full it is headed up and filled with water through the bung. This process is called mild curing because the brine is not strong enough to keep the salmon unless kept in a cold place. They remain in cold storage until they are to be used. When opened for use the sides are hung up and smoked. They are then ready to eat as they are, or to be cooked. Connoisseurs prefer smoked salmon to the fresh article and it commands a higher price. The great bulk of the mild cured salmon goes to Germany and it goes without saying that the present great war has put a damper on the salmon fishing industry. Most of the salmon taken in California are mild cured.

MONTEREY FISHERMEN'S ASSOCIATION.

The fishermen of Monterey have formed an association with a membership of 330, to be known as the Monterey Fishermen's Association. The object is to get a better price for their salmon. They have usually gotten four cents per pound for their fish, but this year, on account of the war and the resulting slump in the mild cured salmon market, the dealers in fish thought three cents was enough to pay for the salmon. We understand the fishermen through the association have been able to contract their fish as usual at four cents per pound.

CONSERVATION IN OTHER STATES.

A SCHOOL OF FISHERIES.

At the initial meeting of the Pacific Fisheries Society at Seattle there was discussed the proposition of establishing a school or department of fisheries in connection with the University of Washington. The object of this school would be to bear the relation to the fish industry that is borne in their way by the schools of forestry and mining to the basic activities which they represent, and by the agricultural experiment station to industries based upon the products of the soil.

Dr. Smith of the United States Bureau of Fisheries said at that time: "This is a wide field; I do not know of any more promising field in the government service than in the culture of fish. The possibilities of making new discoveries, especially in the line of intensive breeding and selective breeding, are almost inexhaustible. I would expect that a tremendous boom to the fish industry of the entire country would be given by a fisheries school such as this if established here."

The fishing industries on the Pacific Coast are largely centralized in the northwest; hence the University of Washington occupies a strategic position. The location of the school here would permit of close co-operation with the various industrial activities related to fisheries. It is to be hoped that this school will actually be established and that it may help to fill the present need for trained men to conduct research experiments on better methods of breeding fish and administering this resource.

A NEW BIRD SANCTUARY IN CONNECTICUT.

Forest and Stream (February, 1915, p. 82) records the creation of a new bird sanctuary at Fairfield, Connecticut. Ten acres of hilly country have been donated and a cat-proof fence has been erected.

Mrs. Mabel Osgood Wright has been placed in charge of "Bird Craft Sanctuary" and an attractive bungalow has been erected for the caretaker. Berry-bearing shrubs will be planted and artificial feeding carried on. "Although part of the mission of the Bird Craft Sanctuary is to interest and to instruct the people of the surrounding country in regard to its bird life, its primary object is the preservation of native birds, both for the sake of their beauty and song and because of their economic value." No visitors will be allowed during the spring and early summer, lest the nesting birds be disturbed.

MINNESOTA COMMISSION TAKES UP EDUCATIONAL WORK.

A number of state fish and game commissions are becoming convinced of the fact that the development of a public sentiment favoring game conservation is a very necessary item to law enforcement and that education as to the value of and the need for game conservation is more important in the long run than arrests and convictions. The last commission to undertake such work is the Minnesota Game and Fish Commission, which has just undertaken the publication of a new quarterly bulletin called *Fins, Feathers and Fur.*

MISSOURI'S NEW GAME LAW.

Missouri has just passed a new game law. It seems that a number of concessions had to be made by conservationists because of the fact that the whole state commission and all of the laws regarding game were threatened. Consequently Mr. E. T. Grether, editor of the "Rod and Gun" department of the *St. Louis Daily Globe-Democrat*, who has done much to obtain the present laws, believes the new measures to be good ones. Two things are of particular interest; first, absolutely no attention is paid to the Federal Migratory Bird Law, which apparently is considered to be detrimental to the interests of the Middle West; and second, spring shooting is to be allowed, for there is an open season on wild-fowl in fall and another one extending from January 1 to April 30 in the spring.

Mr. Grether writes that careful investigations are being carried on to obtain definite information as to whether any of the ducks are breeding during these spring months.. Photographs showing the condition of the birds, taken by Professor Frank Schwarz of the St. Louis Naturalists' Club and Mr. Grether are to furnish the evidence. The statement is made that all of the ducks so far examined do not contain developing eggs and that the "presence of pin feathers showed them to be in the moulting season and not in the breeding season." Also that ducks no longer breed in Missouri. Could it not be that the spring shooting which Missouri has so long permitted is directly responsible for this lack of breeding birds?

STRINGENT HUNTING LAWS PROPOSED IN MASSACHUSETTS.

An effort is being made in Massachusetts to require licensed hunters to make a sworn statement of game killed each year as a condition to receiving a license the following year, that licenses be not issued to hunters under eighteen years of age, and that hunting on private property, whether posted or not, may be only permissible when the hunter has secured the written consent of the owner, upon penalty of revocation of license.—*Fins, Feathers and Fur*, March, 1915.

A SPORTSMEN'S LEAGUE FOR OREGON.

All of the different sportsmen's organizations in Oregon have united to form the Oregon Sportsmen's League. Each club is entitled to representation according to membership. The working body consists of an executive committee composed of seven members, one from each of the seven game districts of the State. The effectiveness of the various organizations will doubtless be greatly improved through this new consolidation plan. Oregon has initiated several unique methods of administering her game resources; hence this new move will be watched with interest.

LIFE HISTORY NOTES.

A RECORD OF THE NESTING OF THE WOOD DUCK IN CALIFORNIA.

On May 3, 1914, I discovered a nest of a wood duck (*Aix sponsa*) in a sycamore tree on the bank of the Sacramento River about ten miles north of Sacramento. The nest was about two feet in diameter and overhung the water. The hole or entrance to the nesting place was about twelve feet from the ground. The cavity itself was about thirty inches deep and about twelve inches in diameter at the entrance. The nest was composed entirely of down and contained thirteen eggs. The female bird was frightened from the nest.

By keeping the eggs at the proper temperature with hot cloths and engine waste from the engine of my launch they were safely brought to Sacramento. Here they were placed beneath a mallard duck which was making her nest in Southside Park. The eggs were transferred to the nest after dark, and within a few minutes the mallard had returned to her nest. Every one of the thirteen eggs hatched out. Later, however, a number of the birds died. On the Fourth of July last, a fireworks display was held at this park. This frightened a number of the young birds to death. At the present time there are only four live birds, two males and two females. These birds are not pinioned, and they often fly to an adjoining field where there is some wild land and tule. They always return, however, at the regular feeding time.

For a number of years I have known the locality where this nest was found and have noted several trees in which wood ducks nest. It appears to be customary for the same duck to nest in the same tree each year. I have occasionally seen as many as three females endeavoring to take possession of the same hole in a sycamore tree.—George Neale.

DO SOME OF OUR MIGRANT DUCKS COME FROM THE GREAT BASIN?

I recently obtained an aluminum band that was taken from a male pintail duck (*Dafila acuta*) killed near Herndon, Fresno County, on January 24 of this year. The band had this inscription on one side: "No. 574" and on the other side: "Notify U. S. Agt., Washington, D. C."

After obtaining possession of the tag, I wrote as requested and received word from the assistant biologist, Alex Wetmore, that the metallic band was placed on the duck September 16, 1914, at the mouth of Bear River, Utah. He also stated that the duck was one that had recovered from the sickness similar to that which affects ducks around Tulare Lake. Does this not show that at least some of our water fowl migrate into California via the Great Basin?—S. L. N. Ellis.

CINNAMON TEAL AND SPOONBILL NESTING ON APRIL 15.

A trip to some overflow land about two miles north of Alvarado, Alameda County, disclosed the fact that a number of ducks were already nesting on April 15, 1915. The following nests were found:

Species	Number of eggs	Location of nest
Cinnamon teal (*Querquedula cyanoptera*)	11	Sedge
Cinnamon teal (*Querquedula cyanoptera*)	5	Sedge
Spoonbill (*Spatula clypeata*)	10	Pickle weed (poorly concealed)
Spoonbill (*Spatula clypeata*)	10	Sedge (eggs covered with down)

Many mudhens' nests were also found containing sets of from eight to thirteen eggs. The eggs from the above nests were collected and taken to the game farm to be hatched out in order to carry on certain experiments and that more exhibition birds may be available another year. —H. C. Bryant.

MALLARDS' NEST AT GAME FARM.

On April 15, six mallard ducks (*Anas platyrhynchos*) were nesting on the State Game Farm at Hayward. On the 23d four more had taken up the duties of incubation. Most of the nests were hid away in the tall grass surrounding the small pond in which the ducks are kept. Complements of twelve eggs were most common. One female refused to leave her nest on any one's approach and attempted to defend her nest by attacking the intruder viciously with her bill. Last year a number of broods were successfully reared, and doubtless greater success will attend the efforts of the superintendent this coming year. The experiments in rearing ducks have been carried on on a very small scale, but nevertheless they demonstrate the fact that mallards can easily be reared in captivity. In artificial propagation we have a solution of the problem as to a means of supplying our markets with game.—H. C. BRYANT.

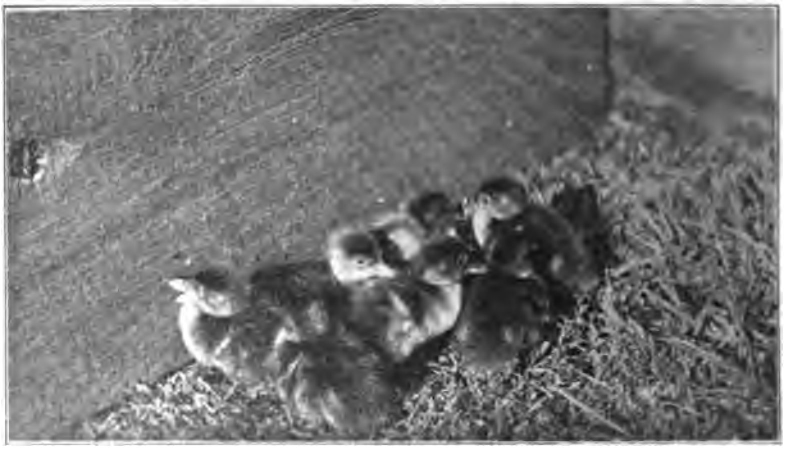

Fig. 44. Some downy redheads. These little ducks were hatched in an incubator at the State game farm from eggs procured in the marshes near Alvarado, Alameda County.

CALIFORNIA CLAPPER RAIL BREEDS IN ALAMEDA SALT MARSHES.

On April 3, 1915, I discovered a nest of the California clapper rail (*Rallus obsoletus*) on Bay Farm Island, Alameda County. The nest was hidden beneath a small clump of the common composite, *Grindelia cuneifolia*. No attempt has been made to use building material and the nine eggs were simply laid in salt grass, the crushed-down stems forming the only bedding for the eggs. A bird was flushed from the nest; whether a male or a female, I could not determine.

Another nest found the same day by Dr. Grinnell had originally contained nine eggs, but five of them had been broken by some predacious mammal, probably a rat. This nest was concealed in pickle weed (*Salicornia*) and several dry stems of this same weed composed the nest proper.

No more definite information regarding the benefit to be derived from the Federal Migratory Bird Law is at hand than the remarkable increase of the California clapper rail. This bird, with a limited distribution—the salt marshes around the southern arm of San Francisco Bay—was so reduced in numbers four or five years ago, that the species would doubtless have become absolutely extinct within a very few years. The five-year close season afforded by the Federal Migratory Bird Law evidently came in good time, for the birds are now increasing remarkably fast. The species is apparently prolific, for the average set of eggs is nine. A comparison of the numbers to be seen in the salt marshes of Alameda County at the present time with those of four or five years ago shows that the species is fast returning to normal numbers. We trust that this dependable evidence will form a basis for future legislation and will convincingly show the value of a five-year close season. —H. C. BRYANT.

AT THE END OF THE MIGRATION SEASON.

Investigations in the vicinity of Los Banos, Merced County, May 10-14, 1915, gave evidence that the nesting season for ducks was just beginning. But one duck's nest, that of a cinnamon teal (*Querquedula cyanoptera*), containing the incomplete set of seven eggs, was found. Practically all the ducks seen were in pairs. A few nests of the avocet (*Recurvirostra americana*) and the black-necked stilt (*Himantopus mexicanus*) were found but most of these birds had not begun nesting. Evidence of a very early nesting of the latter species was obtained through the finding of a family of four downy young, two or three days old, on May 12. Fulvous tree-ducks (*Dendrocygna bicolor*) and white-faced glossy ibis (*Plegadis guarana*) were still flying about in flocks.

The following notes as to the occurrence of certain northern migrants which had evidently lingered behind the main flight are of interest.

Whistling swan (*Olor columbianus*). One seen feeding in shallow ponds on several successive days, May 11-13. It appeared to have full powers of flight.

Northern phalarope (*Lobipes lobatus*). Two or three flocks of about a dozen birds each seen. Two birds which had had a wing completely severed from the body by striking telegraph wires, were found.

Wilson snipe (*Gallinago delicata*). One lone one seen on two different occasions in the marsh near Gadwall, Merced County (last seen on May 11), and a pair seen on a muddy pond ten miles west of Madera, Madera County, on May 14. The call heard in both instances helped in identification.

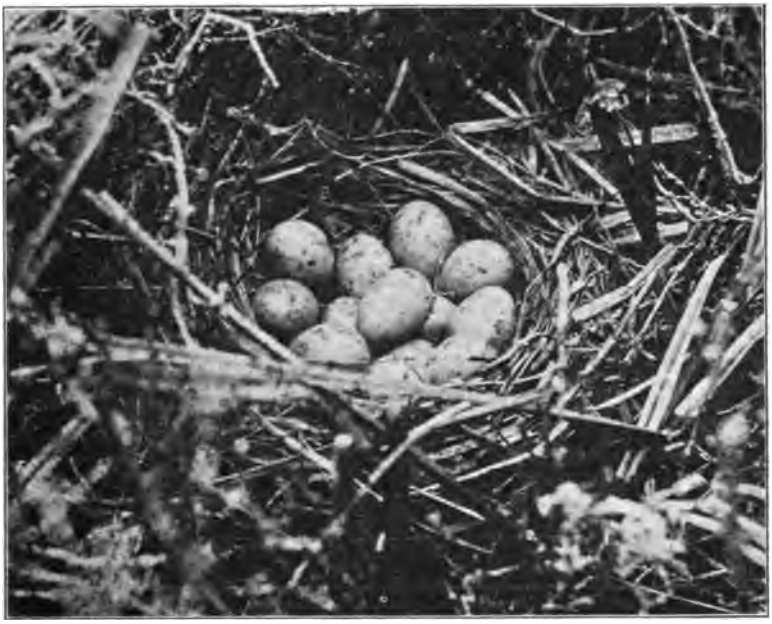

Fig. 45. Nest and eggs of a sora rail, Alvarado, Alameda County, California, April 23, 1915. The nest contained fourteen eggs.

Long-billed dowitcher (*Macrorhamphus griseus scolopaceus*). A flock of eleven seen May 13.

Western sandpiper (*Ereunetes mauri*). A flock of at least two hundred were seen feeding at the edge of a large pond on May 13.

Hudsonian curlew (*Numenius hudsonicus*). One startled from a pond on May 13. It circled around overhead calling loudly.

Semipalmated plover (*Ægialitis semipalmata*). A single bird flushed from a muddy pond ten miles west of Madera, Madera County, on May 14.—H. C. Bryant.

NESTING OF THE SORA AND VIRGINIA RAIL IN ALAMEDA COUNTY.

While investigating some marshes about two miles north of Alvarado, Alameda County, on April 23, 1915, I came upon the nest of a sora rail (*Porzana carolina*). The nest, composed of the stems of grass and reeds, was placed about eight inches above the ground in tall pickle-weed (*Salicornia*). Fourteen eggs in various stages of incubation were in the nest. One of the eggs formed a second layer. No rails were seen in the vicinity.

On the same day I found one egg of a Virginia rail (*Rallus virginianus*) which had evidently been carried away from a nest by some predaceous animal. At any rate the egg had been broken into and the contents sucked out. A comparison of this egg with those of the sora rail left no doubt in my mind but that this egg furnished evidence that the Virginia rail was nesting in the same marshes.—H. C. Bryant.

FISH-CATCHING MUSSELS.

The speed with which a mussel can close its valves, when irritated, is vividly illustrated by the accompanying photograph. (See fig. 46.)

These specimens were taken from the bottom of the sailing vessel *Erskine M. Phelps*, a sister ship of the *William P. Frye*, which was recently sunk by the Germans. After lying at anchor in San Francisco Bay for the past winter (1914-1915), the *Phelps* was taken across the bay and put in dry-dock, being raised from the water on the day following the trip across the bay. The bottom was densely covered with mussels (*Mytilus edulis*), and other organisms. The ship is 312 feet in length and 45 feet in width, and on the bottom area about 50 or 60 fish were found trapped by the mussels. The fish were all in the same condition and comparatively fresh, part of the viscera still being present and the flesh firm.

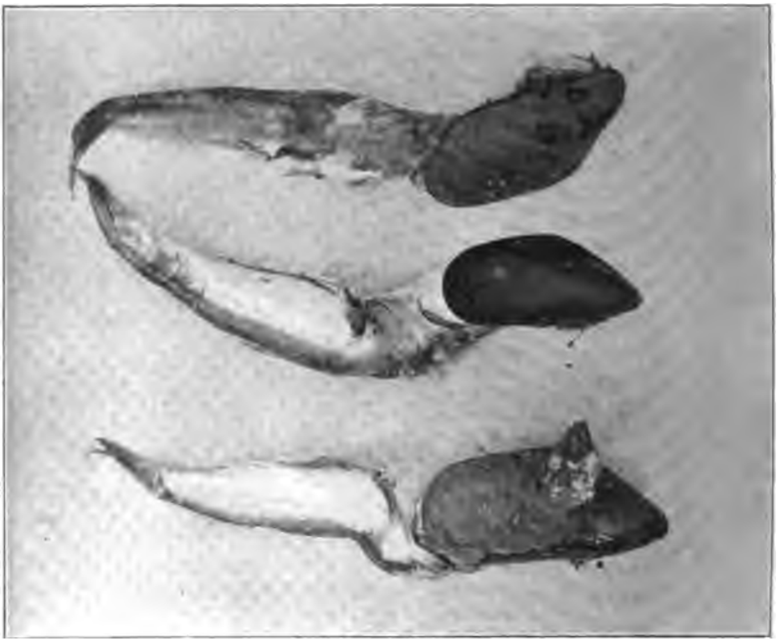

Fig. 46. Mussels which have captured fish. These mussels were taken from the bottom of a ship on San Francisco Bay. The fish are anchovies. (Photograph by E. E. Johnson.)

It is probable that, on the trip across the bay, the ship ran through a school of anchovies (*Engraulis mordax* Girard). Attracted by the edges, or foot, of the mantle of the mussels, many of the anchovies tried to secure a bite, with fatal results. The valves of the mussels were snapped shut with sufficient speed and strength to enclose and hold the more or less pointed head of the fish.—EDWARD E. JOHNSTON.

OPOSSUMS NEAR SAN JOSE CONTINUE TO INCREASE.

Since the appearance of Dr. Grinnell's article on the opossum in the last number of CALIFORNIA FISH AND GAME, this species has been captured in a number of places near San Jose. One of the most interesting of the occurrences is that near Boulder, Santa Cruz County, where about a dozen of these animals have been trapped. The high water in the vicinity of San Jose drove a number of opossums into localities where they were easily caught.

Apparently still another party is partly responsible for the presence of the opossum in Santa Clara County. W. D. Watkins of Campbell, California, brought back in 1900 from Pineville, MacDonald County, Missouri, five opossums. These animals succeeded in gaining their liberty from Mr. Watkins' home, at that time about three miles southeast of San Jose. —I. L. KOPPEL.

WILD LIFE IN RELATION TO AGRICULTURE.

ROBINS AND BLUEBIRDS PROVED FRIENDS OF THE FARMER.

One of the latest bulletins of the Department of Agriculture is that by F. E. L. Beal, assistant biologist, on "Food of the Robins and Bluebirds of the United States."

The conclusion in regard to the robin is that the bird is "omnivorous and feeds upon pretty much every eatable accessible." After an examination of 1,236 stomachs from thirty-two states, the District of Columbia and three Canadian provinces, the conclusion is that the food consists of 42.40 per cent animal matter and 57.60 per cent vegetable matter. As regards the destruction of olives by robins in California, the following statement is made: "Robins rarely attack olives because usually their native food abounds, but where this fails the hungry birds shift about until they find a substitute."

The writer has taken 192 cutworms from the stomach of one western robin collected in Inyo County, California. Furthermore the stomachs of birds collected in strawberry fields near Tres Pinos, San Benito County, where robins were accused of destroying the berries, contained wireworms, beetles, ants, earthworms and a few weed seeds. No evidence that these birds had been feeding on strawberries was found.

"From what is known of the insect food of the varied thrush, it does not appear that the bird is likely to do much mischief by eating useful insects . . . . and the bird does not at present spend the breeding season in a well-settled and cultivated country, and so does not overmuch trespass upon farm products.

"The western bluebird is less migratory than the eastern and does not entirely desert the United States in winter; so its good work is continuous. As insects are active in California in every month, the bird renders a great economic service in the reduction of these pests at this season, for insects that live through the winter are the stock by which the species is perpetuated, and the destruction of a few at this time is equivalent to the death in summer of hundreds or even thousands. That the western bluebird is an eminently useful species is so patent that it hardly needs to be pointed out. Whatever harm fruit growers have suffered from birds, none can be laid at the door of the western bluebird."—H. C. BRYANT.

THE ROADRUNNER OMNIVOROUS.

Three years ago when the California Fish and Game Commission was attempting to determine the economic status of the western meadowlark, the stomachs of a number of other birds about which complaint had been received were collected. The examination of eighty-three stomachs of the roadrunner (*Geococcyx californianus*) has just been completed. Practically all of these stomachs are from birds collected in San Diego County. The investigation has not furnished evidence that the roadrunner preys upon the eggs and young of the valley quail as has often been stated. On the contrary, this bird apparently feeds almost entirely on insects, lizards and mice. As an illustration of the omnivorous food habits of this bird the stomach contents of a roadrunner taken at Lemon Cove, San Diego County, on January 21, 1913, follows:

Vegetable.

2 seeds (*Rhus integrifolia*).
1 filaree seed with stem (*Erodium* sp.).
2 grass blades.

Animal.

6 beetles (*Amara insignis*).
1 beetle (*Eleodes acuticauda*).
5 beetles (*Microschatia inaequalis*).
5 beetles (*Centrocleonus pilosus*).
8 wireworms (Elateridæ).
12 grasshoppers (*Melanoplus* sp.).
1 Jerusalem cricket (*Stenopelmatus* sp.).
2 spiders (Agalenidæ).
1 scorpion (*Anuroctonus phaiodactylus*).
1 spider egg case.
1 lizard (*Uta stansburiana*).

About ninety per çent of the food for the entire year is made of animal matter and but ten per cent of vegetable matter, largely the seeds of a species of sumac. A full report, giving the results of this investigation, will be published later.—H. C. BRYANT.

COTTONTAIL RABBIT REPORTED AS A PEST IN SAN DIEGO COUNTY.

The ranchers of San Diego County have so consistently complained about the depredations of cottontail rabbits that it was found necessary to place a provision in the new law allowing the killing of rabbits when found destroying crops. Mr. G. D. Stead of San Diego writes as follows: "My loss from rabbits was upwards of $350 last season. On the brush side of all fields the grain was eaten off from three to five rods. One piece of wheat was completely eaten off. None to harvest."

Although there is usually a tendency to overestimate the damage caused by a game species, yet the new provision in the rabbit law is a good one and will evidently come as a boon to many ranchers in San Diego County and other places in the State where the cottontail is numerous.

THE EUROPEAN STARLING IN THE EASTERN UNITED STATES.

Every one is familiar with the English sparrow as an example of a foreign bird which has become well established in the United States and which is considered detrimental to man's interests. It appears that a second European bird is now getting such a start in the eastern states that there are grave fears of its becoming a pest similar to the English sparrow. This is the European starling introduced into the United States about twenty-five years ago. Since that time it has extended its range from New York City into the neighboring States of Connecticut, New Jersey, New York, Pennsylvania and Massachusetts. During its migrations it has been found much farther from the original center and has occurred even so far south as the District of Columbia.

The Bureau of Biological Survey reports on the economic value of this bird as follows: "The starling is markedly insectivorous, especially in summer, and preys upon many noxious varieties. In this respect it is to be classed among our useful birds. So far as is known, it has not proved destructive to grain crops, but it is known to be very fond of small fruits, and as it associates in large flocks it is likely to become a pest to the orchardist. In addition, it prefers tree cavities, boxes, or recesses in buildings for nesting sites and thus is brought into direct competition with certain of the useful native birds, more particularly the bluebird, purple martin, white-bellied swallow, house wren, and flicker."

Many of the states where the starling is found have taken protection from the bird in the hope of checking its increase and spread, and the shipment of these birds from one state to another has been prohibited under heavy penalty by an act of Congress. Hence, it can be seen that an endeavor is being made to prevent its becoming too numerous. Nevertheless, there is great danger that the bird, in spite of these acts, will ultimately spread over a large part of the United States. Particular study is being given the food habits of the starling in an endeavor to find out whether it will necessarily be classed as a beneficial or as a destructive bird.

REPORTS.

VIOLATIONS OF THE FISH AND GAME LAWS.

March 1 to May 26, 1915.

Offense	Number arrests	Fines imposed
Game:		
Hunting without a license	20	$275 00
Deer, close season, killing or possession	15	475 00
Illegal deer hides	2	75 00
Ducks, close season, excess bag limit	4	50 00
Quail, close season	3	75 00
Doves, close season	4	100 00
Rail, close season	1	25 00
Tree squirrels, close season	4	100 00
Cottontails, close season	4	75 00
Non-game birds	7	70 00
Total game violations	64	$1,320 00
Fish.		
Angling without a license	29	$535 00
Fishing for profit without license	18	90 00
Underweight striped bass	3	60 00
Trout, close season	16	280 00
Trout, excess bag limit; taking other than with hook and line	15	290 00
Young of fish	2	
Taking shellfish in Monterey Fish Reservation	1	25 00
Illegal nets; traps	22	2,870 00
Catfish, undersize	2	40 00
Crabs, undersize and female	17	90 00
Clams, undersize and excess bag limit	8	100 00
Abalones, close season, undersize	10	205 00
Lobsters, close season	2	40 00
Pollution of state waters	1	
Total fish violations	146	$4,625 00
Grand total fish and game violations	210	$5,945 00

SEIZURES—FISH, GAME AND ILLEGALLY USED FISHING APPARATUS.

March 1 to May 26, 1915.

Fish.

Striped bass	59 pounds
Trout	215 pounds
Miscellaneous fish	56 pounds
Crabs	366
Clams	522
Abalones	76
Lobsters	7
Illegal nets and traps	12

Game.

Deer meat	709 pounds
Hides	12
Ducks	6
Non-game birds	32
Cottontails	8
Squirrels (tree)	2
Miscellaneous	6

SEARCHES.

Illegal fish and game	226

LION BOUNTIES.

Statement of Lion Bounties Paid by Fish and Game Commission from January 1 to May 30, 1915.

	1914	January 1 to May 30, 1915	Total
Alameda			1
Amador			8
Butte	1		30
Calaveras	1		8
Colusa	2		13
Del Norte	4	1	76
El Dorado	1		36
Fresno	1	1	11
Glenn	1		36
Humboldt	46	19	459
Inyo	1	2	4
Kern	5	1	60
Lake	5	5	76
Lassen			6
Los Angeles	5	1	20
Madera	9		20
Mariposa	9	1	32
Mendocino	15	6	156
Merced			1
Modoc			3
Monterey	3	5	53
Mono	2		2
Napa			3
Nevada			3
Orange			4
Placer	3	1	26
Plumas			8
Riverside			13
San Benito	2	1	23
San Bernardino	1		13
San Diego	2		27
San Luis Obispo	7	2	47
San Mateo			1
Santa Barbara	4	1	62
Santa Clara	1		7
Santa Cruz			1
Shasta	9	5	182
Sierra			6
Siskiyou	31	9	224
Sonoma	2		14
Stanislaus			3
Sutter			1
Tehama	5	3	145
Trinity	13	4	229
Tulare	10	2	49
Tuolumne	2	3	33
Ventura	1	3	23
Yuba			3
Totals	204	76	2,261

Lion Bounty Claims.

A bounty of twenty dollars ($20.00) on the scalps of mountain lions is paid by the California Fish and Game Commission on meeting certain requirements. Claim blanks will be sent on application.

FINANCIAL REPORT.

Statement of Expenditures for the Months of February, March and April, 1915.

	February		March		April	
GENERAL ADMINISTRATION.						
Commissioners' traveling and other expenses	$13 00		$77 85		$163 27	
Salaries of administrative assistants	1,045 00		1,045 00		1,045 00	
Traveling expenses of administrative assistants	53 65		79 85		132 40	
Rentals, office and other supplies	295 02		309 75		354 79	
		$1,406 67		$1,512 45		$1,695 46
GENERAL FISH AND GAME PATROL.						
San Francisco Division.						
Salaries of deputies and employees	$2,866 50		$2,936 50		$2,923 00	
Traveling expenses of deputies and employees	953 42		1,175 64		1,226 88	
Rentals, office and other supplies	217 68		177 05		170 94	
		4,037 60		4,289 19		4,320 82
Sacramento Division.						
Salaries of deputies and employees	$2,641 17		$2,510 00		$2,377 00	
Traveling expenses of deputies and employees	1,113 87		1,115 39		1,004 75	
Rentals, office and other supplies	75 27		48 72		306 36	
		3,830 31		3,674 11		3,688 11
Los Angeles Division.						
Salaries of deputies and employees	$875 00		$934 00		$912 00	
Traveling expenses of deputies and employees	177 65		318 82		236 79	
Rentals, office and other supplies	170 20		142 39		135 76	
		1,222 85		1,395 21		1,284 55
Fresno Division.						
Salaries of deputies and employees	$1,047 00		$938 00		$961 67	
Traveling expenses of deputies and employees	555 02		466 06		375 40	
Rentals, office and other supplies	129 32		86 80		89 65	
		1,731 34		1,490 86		1,426 72
Miscellaneous Expenditures.						
Prosecutions and allowances		379 61		339 06		417 00
General printing		314 95		----------		297 12
Total, general administration and patrol		$12,923 33		$12,700 88		$13,129 78

FINANCIAL REPORT—Continued.

Statement of Expenditures for the Months of February, March and April, 1915—Continued.

	February		March		April	
Probable cost general administration and game patrol (60%)		$7,753 998		$7,620 528		$7,877 87
Probable cost general administration and fish patrol (40%)		5,169 332		5,080 352		5,251 91
		$12,923 33		$12,700 88		$13,129 78
FISHERY EXPENDITURES.						
Administration.						
Salaries of superintendent of hatcheries and assistants	$350 00		$350 00		$262 50	
Traveling expenses, superintendent of hatcheries and assistants	146 16		105 05		98 85	
Office and laboratory supplies, etc.	35 95		59 30		42 26	
		$532 11		$554 35		$403 61
Fishery Research and Publicity.						
Salaries	$245 00		$364 20		$567 00	
Traveling expenses	27 25		172 65		158 30	
Supplies, etc.	2 15		205 85		723 13	
		274 40		742 70		1,448 43
Screen and Fishway Surveys.						
Salaries	$100 00		$100 00		$100 00	
Traveling expenses	7 35		103 25		80 15	
Supplies, etc.	----------		----------		----------	
		107 35		203 25		180 15
Fish Transplanting (pack-train, messengers, etc.).						
Salaries	----------		----------		----------	
Traveling expenses	----------		----------		$13 50	
Repairs and supplies	----------		----------		16 04	
		----------		----------		29 54
Fish Distribution (car and messengers).						
Salaries	$100 00		----------		----------	
Messenger allowance and traveling expenses	13 50		----------		$1 95	
Repairs	----------		$249 95		4 47	
Supplies, general expense, etc.	1 90		----------		39 65	
		115 40		249 95		46 07

Fish Patrol (launches, etc.).						
Salaries	$242 50		$230 00		$244 00	
Messenger allowance and traveling expenses	79 75		43 45		80 55	
Repairs	4 42		294 20		21 15	
Supplies (oil, etc.)	75 35	402 02	63 16	630 81	157 55	503 25
Sisson Hatchery.						
Salaries	$1,435 50		$1,686 19		$1,603 34	
Traveling expenses	----------		2 75		6 30	
Construction and repairs	3 55		----------		8 25	
Fish food and ice for meat	163 14		242 30		333 25	
General supplies and expenses	23 37	1,625 56	95 99	2,027 23	63 09	2,014 23
Tahoe and Tallac Hatcheries.						
Salaries	$10 00		$10 00		$386 66	
Traveling expenses	----------		----------		56 45	
Construction and repairs	----------		----------		5 80	
General supplies and expenses	----------	10 00	----------	10 00	51 00	499 91
Price Creek Hatchery.						
Salaries	$261 67		$275 00		$242 50	
Traveling expenses	55 70		4 50		41 50	
Construction and repairs	31 30		----------		4 00	
General supplies and expenses	92 31	440 98	113 48	392 98	168 69	456 69
Ukiah and Snow Mountain Hatcheries.						
Salaries	$282 00		$294 12		$342 50	
Traveling expenses	29 90		21 58		30 85	
Construction and repairs	----------		21 36		6 95	
General supplies and expenses	8 70	320 60	66 51	403 57	97 95	478 25
Wawona Hatchery.						
Salaries	----------		----------		----------	
Traveling expenses	----------		----------		----------	
Construction and repairs	----------		----------		----------	
General supplies and expenses	----------	----------	----------	----------	----------	----------

FINANCIAL REPORT—Continued.

Statement of Expenditures for the Months of February, March and April, 1915—Continued.

	February		March		April	
Sisson Hatchery Auxiliary Stations.						
Salaries	$282 00		$660 00		$482 50	
Traveling expenses	28 10		77 10		42 00	
Construction and repairs	268 83		156 85		----------	
General supplies and expenses	21 23	600 16	30 95	924 90	68 95	598 45
Scott Creek and Brookdale Hatcheries.						
Salaries	$185 50		$284 00		$280 00	
Traveling expenses	4 00		2 30		60	
Construction and repairs	70		4 60		9 58	
General supplies and expenses	19 64	209 84	74 59	365 49	71 76	361 94
Bear Valley Hatchery.						
Salaries	----------		----------		$165 16	
Traveling expenses	----------		----------		21 50	
Construction and repairs	----------		----------		----------	
General supplies and expenses	----------		----------		10 15	196 81
Miscellaneous Expenditures.						
Printing and lithographing fishing licenses, notices, application blanks, etc.		----------		----------		35 76
Angler's license commissions and refunds		269 10		263 40		438 90
Market fishing license commissions		----------		43 25		199 50
Crawfish inspection		35 00		129 03		100 00
Total fishery expenditures		$4,942 52		$6,900 91		$7,981 49

GAME EXPENDITURES.

Hayward Game Farm.						
Salaries	$200 00		$230 00		$200 00	
Traveling expenses	1 20		6 50		1 80	
Rent	37 50		37 50		37 50	
Construction and repairs	46 35		16 00		86 75	
Feed for birds	76 55		54 20		71 60	
General supplies and expenses	34 53		105 28		57 22	
		$396 13		$449 48		$454 87
Game Research and Publicity.						
Salaries	$233 50		$358 80		$629 40	
Traveling expenses	35 05		100 68		9 85	
Supplies, etc.	50 23		317 54		1,074 40	
		318 78		777 02		1,713 65
Miscellaneous Expenditures.						
Printing and lithographing of hunting licenses, notices, application blanks, etc.		----		----		----
Hunting license commissions and refunds		662 00		277 40		1,291 70
Mountain lion bounties		380 00		420 00		220 00
Total game expenditures		$1,756 91		$1,923 90		$3,680 22
Grand total of all expenditures		$19,622 76		$21,525 69		$24,791 49
Total of fish expenditures		$10,111 852		$11,981 262		$13,233 40
Total of game expenditures		9,510 908		9,544 428		11,558 09
Grand total		$19,622 76		$21,525 69		$24,791 49

Summary of Expenditures for the Months of February, March and April, 1915.

	February	March	April
General administration, salaries, traveling expenses, rentals, supplies, etc.	$1,406 67	$1,512 45	$1,695 46
San Francisco District, salaries, traveling expenses, rentals, supplies, etc.	4,037 60	4,289 19	4,320 82
Sacramento District, salaries, traveling expenses, rentals, supplies, etc.	3,830 31	3,674 11	3,688 11
Los Angeles District, salaries, traveling expenses, rentals, supplies, etc.	1,222 85	1,395 21	1,284 55
Fresno District, salaries, traveling expenses, rentals, supplies, etc.	1,731 34	1,490 86	1,426 72
Hatchery administration, salaries, traveling expenses, rentals, supplies, etc.	532 11	554 35	403 61
Fishery research and publicity, salaries, traveling expenses, supplies, etc.	274 40	742 70	1,448 43
Screen and ladder survey, salaries, traveling expenses, supplies, etc.	107 35	203 25	180 15
Fish transplanting, salaries, traveling expenses, supplies, etc.			29 54
Fish distribution car, salaries, traveling expenses, supplies, etc.	115 40	249 95	46 07
Fish patrol launches, salaries, traveling expenses, supplies, etc.	402 02	630 81	503 25
Sisson Hatchery, salaries, traveling expenses, supplies, etc.	1,625 56	2,027 23	2,014 23
Tahoe and Tallac Hatcheries, salaries, traveling expenses, supplies, etc.	10 00	10 00	499 91
Price Creek Hatchery, salaries, traveling expenses, supplies, etc.	440 98	392 98	456 69
Ukiah and Snow Mountain Hatchery, salaries, traveling expenses, supplies, etc.	320 60	403 57	478 25
Wawona Hatchery, salaries, traveling expenses, supplies, etc.			
Sisson Hatchery Auxiliary Station, salaries, traveling expenses, supplies, etc.	600 16	924 90	593 45
Scott Creek and Brookdale Hatcheries, salaries, traveling expenses, supplies, etc.	209 84	365 49	361 94
Bear Valley Hatchery, salaries, traveling expenses, supplies, etc.			196 81
Game Farm, salaries, traveling expenses, rentals, supplies, etc.	396 13	449 48	454 87
Game research and publicity, salaries, traveling expenses, supplies, etc.	318 78	777 02	1,713 65
Prosecutions and allowances	379 61	339 06	417 00
Hunting license commissions and refunds	662 00	277 40	1,291 70
Angler's license commissions and refunds	269 10	263 40	433 90
Market fishing license commissions		43 25	199 50
Crawfish inspection	35 00	129 03	100 00
Mountain lion bounties	380 00	420 00	220 00
Printing and lithographing	314 95		332 88
Totals	$19,622 76	$21,525 69	$24,791 49

Balances February, March and April, 1915.

	February 1		March 1		April 1	
Balance in State Treasury.						
Fish and Game Preservation Fund	$90,392 35		$80,627 11		$76,649 66	
Support and Maintenance Hatcheries Fund	16,376 09		13,871 12		13,018 14	
		$106,768 44		$94,498 23		$89,667 80
In Bank.						
Fish and Game Preservation Fund	$370 00		$1,638 97		$2,651 60	
Support and Maintenance Hatcheries Fund	1,060 00		2,330 00		7,640 00	
		1,430 00		3,968 97	$10,291 60	
Less amount for market fishing licenses, 1915–1916					7,300 00	
						2,991 60
Total belonging to fiscal year 1914–1915		$108,198 44		$98,467 20		$92,659 40
Less monthly bills		19,622 76		21,525 69		24,791 49
Balance		$88,575 68		$76,941 51		$67,867 91

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IN MEMORIAM.

Alonzo F. Lea, a deputy of the Fish and Game Commission for many years, died in Santa Rosa on October 26, 1916. A week previous he fell from a stepladder while repairing an awning at his home in Cloverdale and fractured his skull. At the time it was realized that he was dangerously hurt and as soon as possible he was taken to the hospital at Santa Rosa, where the best of medical skill was available. During the few days that he lingered, he never fully regained consciousness, and died without recognizing those closest to him.

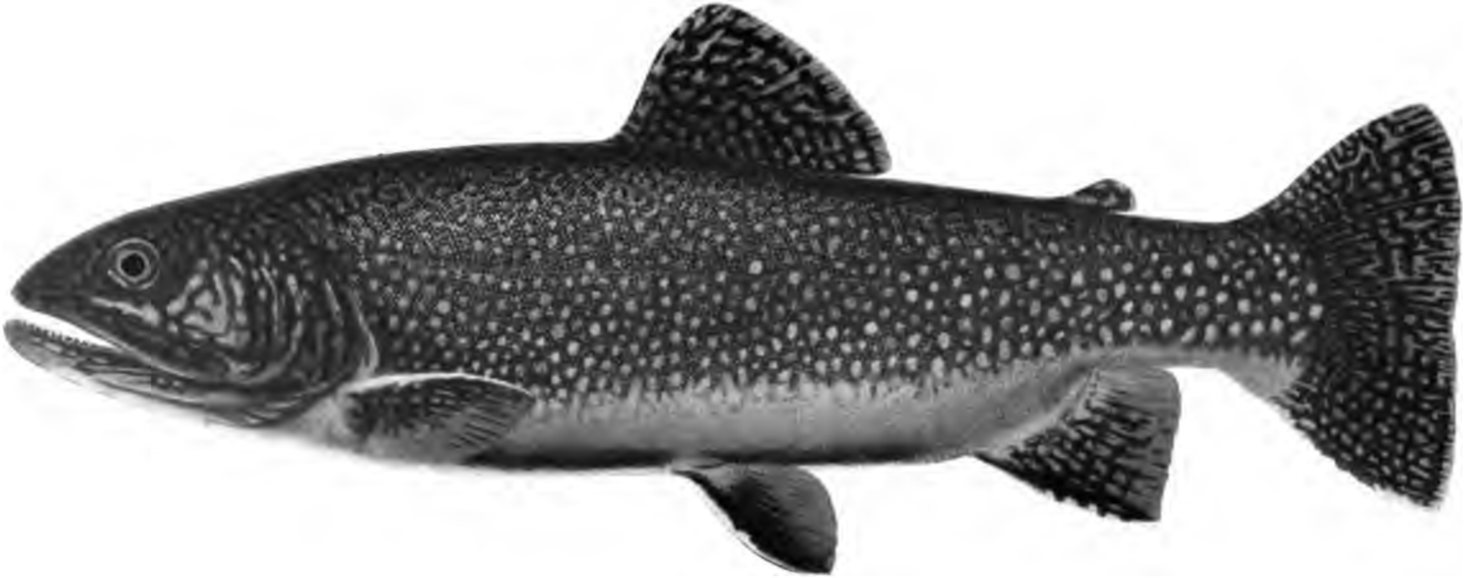
Lea's work for game conservation began during the nineties. In the early days he was detailed to various parts of the state, but his best work was accomplished in Sonoma, Lake and Mendocino counties. His familiarity with the roads and trails, his fearlessness, his extensive acquaintance in all parts of these counties made him a particularly valuable man. The fact that the counties in which he worked are well supplied with game today is largely due to his conscientious work.

He was buried at Kelseyville, Lake County. Notwithstanding the comparative inaccessibility of this town, hundreds of friends came from distant places and many of the public officials of Lake County were present at the funeral. He was borne to his last earthly resting place by associates in the employ of the Fish and Game Commission.

It is difficult to express in words the sentiment that fills us at the burial of a loved and respected friend. The tribute paid him at the grave by his former chief, Charles A. Vogelsang, was fitting and most appropriate. It was as follows:

"We, his former associates and comrades, have come here today to pay our last tribute of respect and affection for one who was our friend, a true soldier in the ranks. His work was characterized by courage, loyalty and integrity. He rendered a great service to the nation and the state. In the performance of his difficult duty he made no enemies, only new friends.

"Of him it can be truly said, 'his life was gentle and the elements so mixed in him that nature might stand up and say to all the world, he was a man.'"
—J. S. H.



—*From drawing by Charles Bradford Hudson*

EASTERN BROOK TROUT *(Salvelinus fontinalis)*

CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

Volume 3 SAN FRANCISCO, JANUARY 20, 1917 Number 1

HISTORY OF THE INTRODUCTION OF FOOD AND GAME FISHES INTO THE WATERS OF CALIFORNIA.*

By W. H. SHEBLEY, in charge Fish Culture, California Fish and Game Commission.

The California Fish Commission during the first decade of its existence introduced into the waters of this state a number of varieties of food and game fishes and the attending results are regarded as being among the greatest achievements in fish-culture and acclimatization. The only work of the kind that will bear favorable comparison is the introduction of food and game fishes into New Zealand. The success of the work was due largely to the untiring efforts of Dr. Livingston Stone, a fish-culturist of that day, in the employ of the New York Fish Commission; and to the study and the practical work of Mr. J. G. Woodbury, who later became Superintendent of Hatcheries for the California Fish Commission.

The most important work in the introduction of new fishes into the state was accomplished during the period from 1870 to 1883; following this came the preservation of the fishes, and the artificial propagation of the native species on a large scale, to multiply their numbers to meet the demands of commerce and of an increasing population.

Since its initial organization in 1870, the Fish and Game Commission has introduced into the waters of California about thirty new varieties of fish, with varying degrees of success. Following is an account of the species introduced, the dates of introduction, and the results obtained:

1. In 1871, the State Fish Commission secured the services of Mr. Seth Green, the noted fish-culturist, to superintend the transportation of a consignment of shad fry across the continent from New York to California. Mr. Green and an assistant left Albany, New York, on June 19, 1871, with 12,000 young shad fry (*Clupea sapidissima*) and arrived at Sacramento on June 26th. The same day the fish were planted in the Sacramento River, at Tehama. About 10,000 of the fry were in good condition at the time the plant was made. Early in June, 1873, a second shipment of shad was made by Dr. Livingston Stone. The trip across the continent was a joint affair planned by the

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[*No state in the Union has been more successful than California in establishing new food and game fishes, but there are comparatively few of our citizens who know the names or the history of the many introductions. It is fortunate that sufficient records have been kept to make possible this outline of the different attempts to introduce desirable species. The present article is an extract from one which appeared in the "California Blue Book" for 1911, pages 513–527. Although some of the scientific names used are obsolete, yet the name used at the time of introduction has been retained without change.—EDITOR.]

federal and the California commissions, and for the first time a car was used especially equipped for the work of transporting the fish. This aquarium car was the property of the United States Fish Commission; it was fitted with tanks for sea and fresh water, ice chests, apparatus for aerating the water, supplies for the attendants, sleeping accommodations, etc. The car carried nearly 300,000 valuable food and game fishes, consisting of ten species. Unfortunately, owing to the collapse of a railroad bridge over the Elkhorn River, in Nebraska, the car was destroyed and the whole consignment was lost. However, this accident did not deter the California Commission from carrying out its purpose of getting a second lot of shad into California. Dr. Stone was instructed to return East and secure another shipment. Accordingly, on the 25th of June, he left Castleton hatchery, in New York, with a third shipment of shad fry and July 2, 1873, 35,000 were planted in the Sacramento River, near Tehama. The expense of this shipment was paid by the United States Commission. Several other shipments were made by the United States Commission between 1876 and 1880. All the shad fry, totaling 619,000, were planted in the Sacramento River, near Tehama. In 1873, two years after the first shad were deposited in the Sacramento River, several mature specimens were taken in San Francisco Bay. The species has continued to increase until it is now one of the most common fish in our waters.

2. The German carp (*Cyprinus carpio*) was first imported into California in 1872, by Mr. J. A. Poppe of Sonoma County. He brought five fish from Holstein, Germany, and put them into his private ponds, where he held them and did a thriving business for a number of years, selling their progeny for purposes of propagation. In 1877, the California Commission exchanged trout eggs with the Japanese Government for 88 young carp, and in 1879, the Federal Commission shipped 298 carp to California; 60 of these were planted in Sutterville Lake, near Sacramento, the remainder in a private pond in Alameda County, where they were at the disposal of the State Commission. During the same year, J. V. Shebley, a fish-culturist and private pond owner in Nevada County, began the propagation of carp; and in 1883, he sold to the California Commission 600 German carp, which were deposited in the Sacramento River, near the city of Sacramento. In 1882, the United States Commission began to deliver carp to private applicants; and in a short time carp were to be found in nearly all public and private waters of the state, in which they would thrive. At the time these plants were made the carp was one of the most popular of fishes; they were recommended as being valuable food fish that would thrive in all of the warmer lakes, ponds, and streams of California. Much has been said for and a great deal more against the introduction of carp into California; but while they probably have been the principal cause of destruction of the California perch, by eating the eggs and digging up the nests, at the same time they furnish the chief food of the black and the striped bass, two varieties of fish whose value more than offsets the damage done by the carp. In time, as other species become more scarce, the carp will probably become one of the state's most valuable food fishes, as it already is in older states and countries.

3. The eastern brook or speckled trout (*Salvelinus fontinalis*) was first introduced into California in 1872. The state purchased 6,000

fish and distributed them equally in the North Fork of the American River, the headwaters of Alameda Creek, and in the San Andreas Reservoir, near San Francisco. The first shipment of eggs (60,000) that produced results was purchased by the California Commission in New Hampshire, in 1875, and hatched at Berkeley. The fry from this lot were distributed principally in lakes and streams in Mendocino, Sonoma, Napa, Yolo, Alameda, and Santa Clara counties, and in Prosser Creek, Nevada County, and the North Fork of the American River, in Placer County. In 1877, 1878, and 1879, eggs were obtained from New Hampshire and Wisconsin, and the resulting fry were distributed over a large area of the state's waters, the North Fork of the American River and the Truckee River receiving the largest plants. The fish planted in the coast streams did not reproduce, but those planted in Siskiyou, Placer, and Nevada counties, and in the high Sierra lakes and streams multiplied remarkably well. In 1890, the work of propagating the eastern brook trout was taken up in earnest and each year the Commission distributes thousands of these trout in nearly every county having suitable waters; they are now one of our most sought after fish.

4. Between 1872 and 1883 the national commission furnished the state commission with six consignments of whitefish (*Coregonus clupeiformis*), aggregating nearly 1,500,000 eggs. The eggs were hatched at Berkeley, at San Leandro, and in a temporary structure erected on Clear Lake, in Lake County, and the fry were distributed in some of the larger lakes and streams of the state that seemed best adapted to the habits of the fish; but they did not thrive. The western or Rocky Mountain whitefish (*Coregonus williamsoni*) found in the Tahoe basin has been often mistaken for the imported species.

5. In 1874, at the request of the California Commission, a second attempt was successfully carried out to bring the common eel (*Auguilla chrisypa*) to California, the first attempt having ended with the disaster to the aquarium car. Of the original shipment, consisting of several thousand small individuals, the loss in transit of the fresh water eel taken from the Hudson River, New York, was almost complete; but twelve survived, and these were placed in a slough of the Sacramento River, near Sacramento; but the salt water eels from New York Harbor stood the journey better, and about 1,500 were deposited in San Francisco Bay, near Oakland. In 1879, Dr. Stone brought out a second shipment of about 500 small eels; these were planted in the Sacramento River. In 1882, Mr. J. G. Woodbury of the California commission transported ten adult eels from the Shrewsbury River, New Jersey, and deposited them in Suisun Bay. There have been no apparent results from any of these plants.

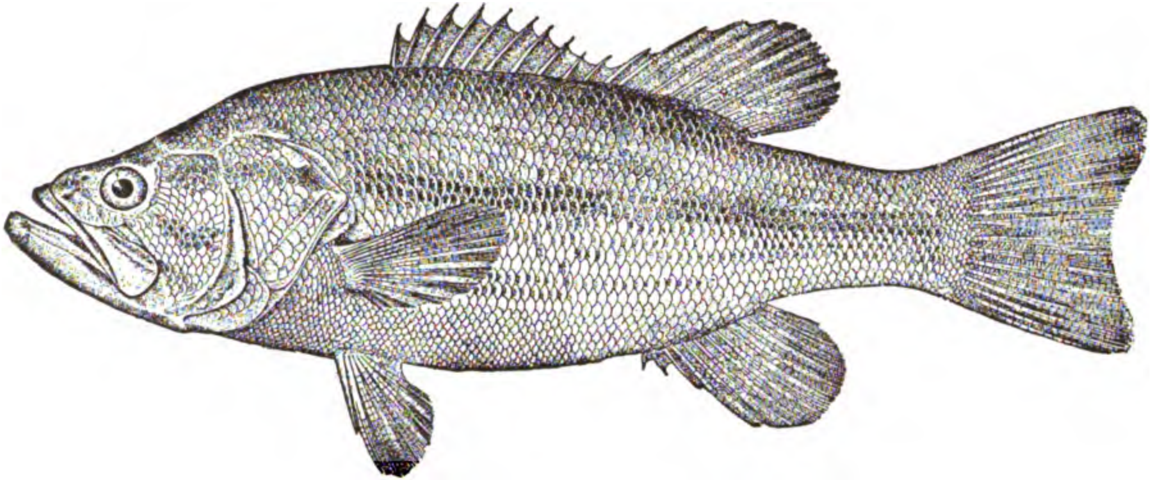
6. The American or eastern lobster (*Homarus americanus*) was first introduced into California waters in 1874, a consignment made the previous year having been lost when the aquarium car was destroyed. Under the auspices of the California commission, Dr. Stone started with 150 full-grown, egg-bearing females from Massachusetts Bay; but four of them reached the coast alive, and these were planted in San Francisco Bay, near Oakland. Subsequently four other small shipments were made, the last in 1888. Plants were made in San Francisco Bay, off Bonito lighthouse, off Point Lobos, to the south of

Carmel Bay, and in Monterey Bay; but although several of those planted in Monterey Bay have been taken by fishermen, no resulting increase in numbers has attended any of the plants made. Thus far the reason for the failure of the lobster to multiply in these waters is not definitely known, as the physical and biological character of the waters of the Pacific Ocean is apparently suitable for its acclimatization.

7. In 1874, several species of catfish were introduced—the common bullhead or horned pout (*Ameiurus nebulosus*), the channel or spotted cat (*Ictalurus punctatus*), the white or Schuylkill cat (*Ameiurus catus*), and one or more species from the Mississippi Valley. On June 12th, fifty-four large Schuylkill catfish from the Raritan River, New Jersey, and the Mississippi catfish, were planted in the San Joaquin River, near Stockton; while seventy bullheads from Lake Champlain, Vermont, were deposited in ponds or sloughs near Sacramento. The Schuylkill cat of the Sacramento River increased very rapidly and soon was as commonly seen in the markets as our native fish.

8. An attempt was made to acclimatize the Atlantic salmon (*Salmo salar*) in 1874, when 305 of the 450 fish brought by Dr. Stone from the Penobscot River, Maine, were planted in the Sacramento River, near Redding. No results were obtained from this plant, as the number of fish planted was not great enough to determine whether they would or would not become acclimated to the waters of the Sacramento. The United States Commission hatched out 200,000 eggs at Fort Gaston, California, in 1890, and in May, 1891, 194,000 fish were liberated in Trinity River; but no run was established.

9. The black basses, both species (*Micropterus salmoides*) the large-mouth and (*Micropterus dolomieu*) the small mouth, have been introduced into California, and have thrived remarkably well. The first shipment, brought out by Dr. Stone in 1874, consisted of seventy-five full-grown spawning bass from Lake Champlain, Vermont, and twenty-four small fish from Saint Joseph River, Michigan, both shipments being of the small-mouth variety; the former were planted in Napa Creek, the latter (twelve survivors), in Alameda Creek. A second shipment of twenty-two mature fish was brought out by Dr. Stone in 1879, and planted in Crystal Springs Reservoir, in San Mateo County, where they increased rapidly; hundreds of the progeny were consigned to various waters in the state. The United States Commission, in 1891, deposited nearly 2,000 yearling large-mouth bass in Lake Cuyamaca, in San Diego County, and 620 in the Feather River, near Gridley. In June, 1895, at the request of the California Fish Commission, the United States Commission delivered 2,500 large-mouth bass fry to the agents of the state commission. These fry were placed in the ponds at the Sisson hatchery, where they thrived, and whence the species was distributed throughout the state, wherever suitable waters were to be found. In the same month, fifty fish were put in each of the following California waters: Buena Vista Lake, near Bakersfield; reservoir near San Diego; and Elsinore Lake, near Elsinore. Agents of the Fish Commission distribute a large number of bass each season from the overflowed districts, where they are seined and deposited in public waters. Both species of the bass are highly esteemed as food and game fishes, and are a great acquisition to the fish life of California.



LARGE-MOUTH BLACK BASS—*Micropterus salmoides.*

Fig. 1. Large-mouthed black bass, first introduced into the waters of California in 1891, when 2,000 yearlings were placed in Lake Cuyamaca, in San Diego County, and 620 in the Feather River near Gridley, Butte County. In 1895 another shipment was received from the United States Fish Commission and placed in ponds at the Sisson Hatchery, from which place they were distributed to all parts of the state.

10. A shipment of eighteen full-grown wall-eyed or glass-eyed pike, or pike perch (*Stizostedion vitreum*) was brought to California in 1874 from the Missisquoi River, Vermont, and sixteen were planted in the Sacramento River, near Sacramento City; but they did not multiply.

11. The tautog (*Tautoga onitis*) was first brought to California by Dr. Livingston Stone in 1874, and a second lot in 1897. Both shipments were deposited in San Francisco Bay; but they consisted of only a few hundred fish each and no results were obtained.

12. Four full-grown rock bass (*Ambloplites rupestris*) of the six obtained from the Missisquoi River, Vermont, were brought to California by Dr. Livingston Stone, in 1874, and deposited in Napa Creek, a tributary of San Pablo Bay, on June 12th. No known results have attended the planting of this fish.

13. In 1877, the California commission exchanged salmon and trout eggs with the Hawaiian Government for a shipment of 100 fish, known as the awa (*Chanos cyprinella*); they were planted in a small stream at Bridgeport, in Solano County. There is no record of any of this species having survived.

14. The eggs of the landlocked salmon (*Salmo salar sebago*) were first brought to California in 1878. Between that date and 1895 at least five shipments were received from the federal commission, totaling about 135,000 eggs. These were hatched at the San Leandro and the Shebley hatcheries, and the fry distributed in the cold lakes of the high Sierras, and in the lakes and streams of the Truckee Basin. A few fish have been taken that had reached maturity, but the species has not increased in numbers. The fish have been held in the hatchery ponds at Sisson for a time and have thrived, but no particular effort has been made to propagate them. A shipment of the eggs was hatched at Sisson hatchery and another lot at Bear Valley hatchery, in the early nineties.

15. One of the most important and successful importations of fish into California waters was made when the striped bass (*Roccus lineatus*) was introduced in 1879. The introduction of this valuable food fish was first suggested by S. R. Throckmorton, president of the California Fish Commission, in a letter to Professor Spencer F. Baird, then United States Commissioner of Fisheries. As a result of this suggestion, Dr. Livingston Stone was instructed to transport a shipment of striped bass to California. Accordingly, he collected from the Navesink River, in New Jersey, 132 fish, ranging from one and one-half to five inches in length, and thirty medium-sized fish. Twenty-five of these died en route, but the remainder, about 135, were deposited in the Straits of Carquinez, at Martinez. Individuals from the first lot were caught in the lower waters of the bay within a year from the time that they were planted, and a number were caught occasionally for several years afterward; but the commission decided to have a second shipment made from the East, as it was not certain that the fish were increasing. Accordingly, in June, 1882, Mr. J. G. Woodbury was sent East by the California Fish Commission to procure another shipment. He collected 450 fish five to nine inches long from the Shrewsbury River, New Jersey, and in the latter part of July arrived with a little over 300 of the fish in good condition; they were planted in Suisun Bay, at Army Point,

near Suisun. Considering the small number of fish introduced and their remarkable increase in a few years, the result obtained from the introduction of the striped bass into California is one of the greatest feats of acclimatization of new species of fish in the history of fish-culture. In 1889, hundreds of them, weighing from one-half to a pound each, were being caught and sold in the San Francisco markets. From 1889 to 1892, the number caught had increased 250 per cent; such quantities were being taken in 1889, it was feared the fish would be exterminated before they had come to maturity and had a chance to reproduce; so the Supervisors of San Francisco County, at the request of the Board of Fish Commissioners, passed an ordinance prohibiting the sale of striped bass under eight pounds in weight. A state law was afterward passed making it unlawful to take bass under one pound; and later this was changed to the present limit of three pounds. It is now also unlawful to ship striped bass from the state. The striped bass is one of the finest food and game fishes in the United States; and if the California Fish Commission had not succeeded in acclimatizing any other variety of fish, the value of the striped bass alone would more than repay the people for all the money expended in introducing other species. Over two million pounds of striped bass have been marketed in one season in San Francisco. This does not include the amounts sold in other places.

16. In 1891, 3,000 yearling yellow or ringed perch (*Perca flavescens*) were deposited by the United States Commission in the Feather River, and 3,980 in Lake Cuyamaca, in San Diego County, where they increased rapidly. A few were taken to Sisson hatchery and placed in the rearing ponds, in 1895. They remained healthy and made a good growth, but owing to lack of pond room no efforts were made to propagate them to any extent. Occasionally a few have been taken from the Feather River and from some of the sloughs in that region, but as the species has not been generally distributed, the results of the planting have not been fully determined.

17. Four hundred yearling warmouth bass (*Chænobryttus gulosus*) from Quincy, Illinois, were planted by the United States Commission in Lake Cuyamaca, near San Diego, in 1891. In the same year, 100 yearlings were deposited in Feather River, near Gridley, Butte County; and in 1895, twelve fish were delivered at Sisson hatchery, but they were not in good condition. Six of them died shortly after they were placed in the ponds; the remaining six survived until the following spring, but food conditions not being suitable, they did not thrive and died before spawning.

18. The crappie (*Pomoxis annularis*) and the strawberry or calico bass (*Pomoxis sparoides*) were introduced in the early nineties, but were not widely distributed. In 1891, 285 yearlings were deposited in Lake Cuyamaca, near San Diego, and in 1895, 50,000 fry were sent to the Sisson hatchery; but none of them lived.

19. In 1891, a shipment of 400 yearling pike (*Lucius lucius*) was made to Lake Cuyamaca, near San Diego, and another 100 were placed in the Feather River, in Butte County. The fish planted in Lake Cuyamaca increased for a time, but those in the Feather River have not multiplied. In 1895, six pike were delivered at Sisson hatchery; they thrived in the ponds for a year, when they were placed in an aquarium

at the Mechanics Fair, in San Francisco, and died before the fair was over. It is well that they died and that those planted in the Feather River did not survive; for the species is too predatory to plant among our valuable fishes.

20. In May, 1893, the New York commission gave 100,000 muskellunge fry (*Lucius masquinongy*) from Chautauqua Lake to the California Fish Commission. The United States Bureau of Fisheries transported the fish free of charge as far as Ogden, from which place the consignment was under the auspices of the California commission, the Spring Valley Water Company paying half the cost of transportation from Ogden to San Francisco. The fish were received in good condition, and 93,000 were placed in Lake Merced, near San Francisco, to destroy the carp in the lake, as they were keeping it roily and made the water almost unfit for use, but they did not survive; and as in the case of the pike, it is probably as well that they did not, for while they are a game fish, they are too predaceous to place among our more valuable fishes. These fish were put in private waters with the understanding that the commission might take such fish for distribution or breeding purposes as might be desirable.

21. The lake trout (*Salvelinus namaycush*), known also as the salmon or Mackinaw trout, was first brought to California in 1894. The shipment of 100,000 eggs was hatched at the Sisson hatchery, with a loss of only 7 per cent. Sixty-five thousand of the fry were planted in Lake Tahoe in May, 1865, the remainder being held in the ponds at the Sisson station and shipped the following season. Several other lots were hatched at Sisson, and the fry deposited in the lakes of the Truckee Basin. A number of these fish are taken each season from the waters that have been stocked, where they have thrived to a considerable extent, but not as well as was expected. This trout is abundant in the waters of lakes Superior, Huron, and Michigan, and should attain a large size in Lake Tahoe, as the species is adapted to cold, clear, deep lakes.

22. In February, 1894, 20,000 eggs of the Loch Leven or Scotch lake trout (*Salmo trutta levenensis*) were sent to the California commission from the stock ponds of the United States Government at Northville, Michigan. They were hatched at Sisson hatchery, and the fry deposited in the hatchery ponds, where they thrived. The stock has been retained in the Sisson hatchery ponds ever since, where they have been propagated successfully, and thousands of the fry are shipped each year for distribution in the public waters of the state.

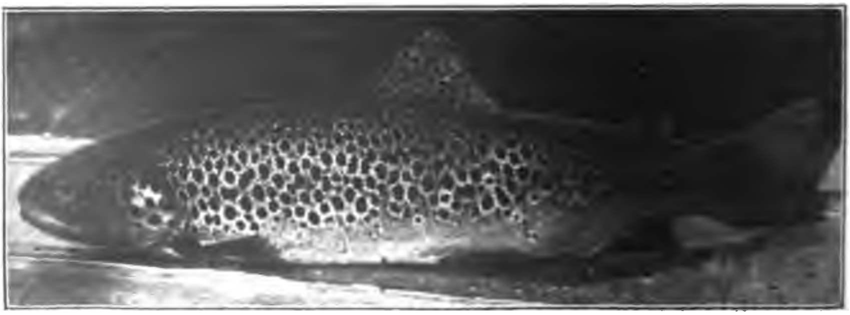


Fig. 2. Loch Leven trout. The original stock of Loch Leven trout was received in 1894, when 20,000 eggs were received from the United States Fish Commission Hatchery at Northville, Michigan. Thousands of Loch Leven trout fry are now shipped out from the Sisson Hatchery each year.

The Loch Leven and the German brown trout are closely allied and appear to be but different varieties of the same species. They are somewhat different in their habits, but do equally well in the clear, cold lakes and streams of the Sierras, as well as in the region around Mount Shasta. The two varieties have been crossed at the Sisson hatchery, and have produced a strong, gamy fish.

23. In 1895, 135,000 Von Behr or German brown trout eggs (*Salmo fario*) were hatched at the Sisson hatchery. Several thousand fry were placed in the ponds to be raised for breeders, and the remainder were distributed in a number of the lakes and streams of the high Sierras. Previous to this the federal government had made several plants in the state.

24. Twelve yearling white bass (*Roccus chrysops*) were received at Sisson hatchery from Quincy, Illinois, in June, 1895. They were not in good condition and seven of them died shortly after their arrival; the others died the following fall. This introductory shipment of white bass is the only one of which there is any record.

25. Small plants of the green sunfish (*Lepomis cyanellus*) and the bluegill or blue bream have been made in California. In 1895, twelve yearlings were delivered to the Sisson hatchery; eighteen were put in Elsinore Lake, and eighteen in the Bolsa Chico River. A few were accidentally introduced with other fish into Lake Cuyamaca, near San Diego, in 1891. Wherever conditions are favorable, these fish have thrived.

26. The California Fish Commission has endeavored to introduce the Montana grayling (*Thymallus montanus*) into the waters of California, but so far without any known results. The eggs are very delicate and the fry hard to raise. In 1904, 100,000 eggs, from Bozeman, Montana, were received at the Sisson hatchery in good condition. Seven thousand of the fry were placed in a pond that was thought suitable for them; they thrived for eighteen months, then became diseased and died off, until only 600 were left; these were placed in a pond where they were in an entirely wild state and could subsist on natural food. These fish and a few that were saved from a lot received the following year grew up together and promised to furnish some eggs for propagation, but owing to the accidental bursting of the pond wall, the fish escaped into one of the tributaries of the Sacramento River, just as they were reaching maturity. Several thousand of the fry were distributed from the second lot of eggs that were received, into waters that, from descriptions given of the fishes' habits, appeared to be ideal, but no results have been noted thus far. The grayling is considered by some anglers to be the most beautiful and graceful of American fresh-water fishes. They rise to the artificial fly more quietly than do the trout, but make a good fight and are an excellent table fish.

The last lot of fresh-water fishes received in California from the United States Bureau of Fisheries was in November, 1908. The fish were shipped from Meredosia, Illinois, and consisted of crappie (*Pomoxis annularis*), blue-gilled sunfish or bream (*Lepomis pallidus*), and yellow perch (*Perca flavescens*). They were distributed as follows:

Four cans of crappie and sunfish in Honey Lake, Lassen County; a number of yellow perch and crappies in Vera Lake, Nevada County;

sunfish and yellow perch in lakes in Placer County, and in sloughs of the Feather and Sacramento rivers; some of all three varieties near Stockton, and in Clear Lake, Lake County; perch and sunfish in Kings River and San Joaquin River, and sunfish and yellow perch in Kern River and Buena Vista Lake. Some of the fish were planted in Russell's Lake, Ventura County, and in suitable waters in Los Angeles, Riverside, and Orange counties. Reports from several of these places have been received and indicate that the fish are thriving and increasing.

No effort has ever been made by the commission to introduce eastern oysters, but it is stated that they were first brought into California in or about 1870, by Mr. A. Booth of Chicago, and it is recorded that the first shipment, consisting of three carloads of large oysters, so overstocked the market that in order to avoid loss the consignee had to plant in San Francisco Bay all the stock not promptly disposed of. The enforced planting resulted favorably, and it became the custom to annually ship one-year and two-year seeds to be planted on the grounds in the southern part of San Francisco Bay, where they remained for two and three years, or until they attained a suitable size for marketing. There have been various reports of wild eastern oysters taken at different points in the bay, and Mr. Chas. H. Townsend, in the Report of the United States Fish Commission for 1889–91, says: "It is possible that during the long time eastern oysters have been kept in the bay they have become in a measure acclimated, and that there is a constantly increasing tendency to propagate—that is, the progeny of oysters grown here become hardier with each generation and better adapted to the colder but more equable waters." Full accounts of the early eastern oyster industry in San Francisco Bay are given in Mr. Townsend's article and in an article by Captain J. W. Collins, in the Report of the United States Fish Commission for 1888.

From 1899 to 1908 the oyster industry decreased gradually, all of the oysters taken in the latter year being taken from private beds, and used for market purposes only. All seed oysters planted that year were shipped from eastern beds.

The appearance of the soft-shell clam in San Francisco Bay was first noted in 1874. The spawn is supposed to have been accidentally introduced with the carloads of eastern oysters planted in the vicinity of San Francisco. They soon covered the mud flats surrounding San Francisco Bay, and were taken in great numbers.

THE FISH DISTRIBUTION OF 1916.

By G. H. Lambson, Superintendent Sisson Hatchery.

When the last carload of trout left the hatchery we gave a sigh of relief to think that the arduous work of the past four months had been brought to a successful conclusion, and that so many fine trout had been planted in the public waters of the state, where all could enjoy the pleasure and profit of catching them. There were the gamy steelhead, the beautiful eastern brook trout, the black-spotted trout from the cold waters of Tahoe, the Loch Leven trout whose ancestors came from Scotland, and last but best our own native favorite—the rainbow. They were fine, lusty fellows, and all were sent forth to the waters best suited to each kind, to add to the health and pleasure of our people.

Our thoughts turned to the many anglers who, by purchasing licenses, supported the hatcheries and made the great work possible. But they have their reward, for any one who catches but two pounds of trout during the season is repaid in a medium as valuable as gold, while he who catches as much as twenty pounds receives a thousandfold return. But there is a greater value, more subtile, but none the less real, that of the health and pleasure of the people. On any summer night along a hundred streams and lakes may be seen gleaming the campfires of the happy anglers, camping out and breathing the health-laden air of wood and stream. The worried business man, the weary laborer, the professional man, all are there, often, with their entire families, and all reaping a greater profit than could be had from any other investment, for health and pleasure are the dividends.

Our state is famous for its beautiful women and keen, alert men of business, and if the cause could be sifted into its component parts I wonder how much would be found to be due to our well-stocked streams? Surely it would be very large.

The favorite prescription of the physician is to "take a rest, go out into the country and live next to nature," and, I would add, come back with renewed vigor for the strenuous life of today. But the physician's advice is disregarded unless there is some incentive to urge them on, and this is supplied by the fine fishing in our streams and lakes which are stocked annually from the hatcheries.

The commercial side has also received close attention and millions of salmon have been planted in the Sacramento and Klamath rivers. They were not the small fish of the earlier season, but fine, big, well-fed yearlings from three to six inches long, fish that are fully able to cope with the dangers that beset them on their journey to the sea, and which will return in from three to six years as mature salmon and add to the wealth of the state, to the delight of the angler, and to furnish a delicious food to those who must, perforce, procure their fish from the market. In our twenty years' experience in salmon work we have never seen planted such large and healthy fish as those distributed this season.

In the distribution from the Sisson hatchery there were forty-three carloads of the various kinds of trout, each averaging 100 cans, and many thousands were sent out by messengers. There were fifteen carloads of salmon planted in the Klamath River, while the Sacramento was stocked direct from the hatchery by wagon. We can not conceive of a better investment, or one that benefits a greater number of people than the hatcheries. Every class and family, the angler, the commercial fisherman, the dealer or packer, all share in the dividends which are declared daily. Truly our state is a favored one.

SCIENTIFIC NATURE STUDY IN THE PUBLIC SCHOOLS.

By Georgie V. Miller.

We are apt to think of the law of supply and demand as an important and everlasting plan which no amount of neglect will spoil. It is not usually until the loss caused by waste or mismanagement directly affects us that we begin to consider a way to prevent a crisis.

Forests, for example, a few years ago were found to be deteriorating so fast that the government and different states took up the matter of their conservation with added seriousness of purpose. Courses of forestry were established in the various colleges, and conditions partook of a new aspect.

That was the medieval step in forest conservation through education. The modernist perceives cooperation through enlightenment of the people at large—not of the few whom the university courses directly reach. "Teach the children of the public schools the common names and uses of the trees," said Professor Tower of the Department of Forestry, University of Maine. "This will create in them a desire for further knowledge of the subject, and give them, not too late, a reason for the folly of waste."

Don Carlos Ellis, in charge of educational work for the United States Forest Service, made an everlasting impression upon the school children of San Francisco who were so fortunate as to hear his lectures and see their accompanying motion pictures, during the recent exposition. The United States Forest Service is placing emphasis on the educational method of forest conservation.

A campaign is on for the conservation of wild life through education. The courses are so well conducted and attended, and the names of those in charge so familiar, that I need not dwell upon this phase of the work. Be it sufficient to say, however, of wild life as a study, that its really systematic introduction occurs, generally speaking, in the university. Nearly all the work in the grades is merely incidental. A hint to us that the children will be sought in case of a doubtful situation, is the recent urgent appeal to them to save all newspapers against a possible paper famine. Then give the children something substantial in nature study. Beside its scientific and economic lessons the work has its moral and artistic values, the habit of killing being reduced to a minimum when students have learned to thoroughly enjoy animals and birds alive through knowing them. The study will prove pleasurable to them and profitable to everyone.

A country or suburban teacher has not far to look for available material. I found the boys knew the local birds, and were desirous of studying their habits more closely. Next came birds of exceptional interest from other regions, for nature study should no more be confined to one small corner of the world than is geography.

It was not until last year that I ventured to introduce bird study in a city school. Leo Wiley, collector of specimens, had sent me a number of bird skins as an aid. Several lessons had been given after my usual method of procedure, when I promised to show the class on the following day the skin of a California roadrunner.

Unusual excitement followed this announcement. The majority of the boys thought it a new kind of automobile. How could I show the skin of a machine? But the girls were sure it was a snake, and shivered becomingly. Not one had ever seen a roadrunner. They examined the stiff eyelashes, speculated upon what the bird must eat, marveled at the length of his legs, now fully understanding why the Spanish called him *"correo del camino,"* which our Anglo-Saxon pioneers later translated to roadrunner.

Each of the specimens was shown many times, not only to the members of my own class, but to others. The boys had spread the news, and so extravagantly that many believed my supply equal to a museum's. I was gratified, even though enthusiasm had got the better of veracity in several instances. I felt like the Pied Piper, only that in our case a way to new observations had been opened to the children without the closing of a mountain, behind which lay the joys of childhood.

That those boys will look and listen when afforded an opportunity I have no doubt. During vacation a newsboy whose name was unknown to me, tucked a copy of the "Bulletin" under my arm. He smiled sweetly, and I was about to pay him when he shook his head and rushed after a prospective customer. On his way I heard him reply to a companion, "No, not mine—the big guys' teacher; the one that knows everything about birds."

So many teachers have expressed the desire for something definite as an aid to the introduction and presentation of the subject of birds, that I submit the following outline. This I have used successfully, in more or less the same form, a number of years. There are innumerable reference books, among them Mrs. Bailey's "Handbook of Birds of the Western United States," than which none is more complete at the present time.

DETAILED OUTLINE FOR THE STUDY OF ANY BIRD.

I. Location.
  1. State or portion of state.
  2. Woods or open.
  3. Swampy or dry section.
II. Description.
  1. Size.
    (1) Compared with robin.
    (2) Compared with English sparrow.
  2. Shape.
    (1) Body.
      a. Long and slender.
      b. Short and stocky.
    (2) Head.
      a. High or crested.
      b. Small and nearly horizontal with body.
    (3) Bill.
      a. Large and strong.
      b. Short and stocky.
    (4) Tail.
      a. Long.
      b. Short.
      c. Notched.
      d. Forked.
      e. Rounded.
    (5) Wings.
      a. Long.
      b. Short.
    (6) Feet.
      a. Large and strong.
      b. Small and weak.
  3. Color.
    (1) Upper parts.
    (2) Lower parts.
    (3) Special markings.
      a. Chin.
      b. Eye.
      c. Rump.
      d. Tip of tail.
      e. Under tail parts.
      f. Outer tail feathers.
      g. Wings or wing bars.
      h. Belly.
      i. Breast.
  4. Movements.
    (1) On the ground.
    (2) In flight.
    (3) On perch.
III. Family.
  1. Sparrow-finch.
  2. Swallow.
  3. Flycatcher.
  4. Goatsucker, swift, hummingbird.
  5. Lark.
  6. Warbler.
  7. Thrush.
  8. Waxwing.
  9. Tanager.
  10. Wren, thrasher.
  11. Vireo.
  12. Kinglet.
  13. Oriole, blackbird.
  14. Crow, jay, magpie.
  15. Kingfisher.
  16. Nuthatch.
  17. Woodpecker.
  18. Shrike.
  19. Owl.
  20. Hawk, eagle.
  21. Vulture.
  22. Grouse, partridge, quail.
  23. Snipe.
  24. Plover.
  25. Roadrunner.
IV. Food.
  1. Vegetable.
  2. Animal.
  3. Manner of obtaining—
    (1) While in flight.
    (2) Flying from perch.
    (3) From trees or insects in trees.
    (4) From the ground.
V. Song or call.
VI. Residence.
  1. Summer.
  2. Winter.
  3. Permanent.
  4. Transient.
VII. Migration.
  1. Time.
  2. Place.
VIII. Nesting.
  1. Time.
  2. Place.
  3. Kind of nest.
  4. Eggs.
    (1) Number.
    (2) Color.
    (3) Size.
  5. Young birds.

CALIFORNIA FISH AND GAME

A publication devoted to the conservation of wild life and published quarterly by the California State Fish and Game Commission.

Sent free to citizens of the State of California. Offered in exchange for ornithological, mammalogical and similar periodicals.

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All material for publication should be sent to **H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.**

January 20, 1917.

"The United States is not yet ours in the proudest sense, and can not be until we are doing all that can be done to give to all its people and to the world the full expression of its highest intelligence applied alike to its resources and to the life of the people."
—Franklin K. Lane.

WILL YOU DO YOUR SHARE?

Please read again the above quotation by Franklin K. Lane, Secretary of the Interior, and emphasize the words "full expression' and "resources." What is California's "full expression of its highest intelligence applied to its fish and game resources?" Is it the still noticeable disregard for protective laws? The noticeable waste of a valuable food supply? The neglect of valuable species reduced to the danger point? The tolerance of the game hog? No! The full expression of California's highest intelligence is more than this. With the convening of the legislature this month there is opened another chance to better game conditions and conserve for the future the wild life resources of the state. The goal suggested above can only be reached when all the people of the state take an interest in fish and game and do their share toward its realization. See that your representatives believe in "conservation" and back up their belief with action. Do your share!

WHAT DO YOU WISH TO KNOW ABOUT FISH AND GAME?

The Bureau of Education, Publicity and Research of the California Fish and Game Commission should be made a clearing house for information on fish and game. Are you not anxious to know the truth regarding the life and habits of some game species? The number of false stories which are current is appalling. Settle your disputes by writing the bureau. If we are unable to answer your question we will refer it to someone who can answer it. The reply will be sent you by mail or will appear in the columns of CALIFORNIA FISH AND GAME, at your pleasure.

CARL WESTERFELD.

NEW EXECUTIVE OFFICER.

At a called meeting of the State Fish and Game Commission, held at Sacramento on December 8, 1916, Carl Westerfeld, fish and game commissioner since November, 1911, resigned as commissioner and Mr. Edward L. Bosqui of San Francisco was appointed by Governor Johnson to fill the vacancy. The commission then appointed Mr. Westerfeld as executive officer to succeed Ernest Schaeffle, who resigned in September, 1916. All who know Mr. Westerfeld are congratulating the commission on its choice and the whole state on its good fortune in obtaining the services of so capable a man.

Carl Westerfeld was born in San Francisco and has lived in that city all of his life, with the exception of the few years spent at college. He took his A.B. at Yale University in 1893, and in 1896 graduated from Hastings College of Law. He was admitted to the bar and has since made a name for himself in his profession. His interest in fish and game led to his appointment as commissioner, and to his election as president of the Pacific Fisheries Society in 1914. For the past five years Mr. Westerfeld, although having many personal interests, has given a great deal of time and attention to the work of the Fish and Game Commission, and consequently is in close touch with its activities and plans.

THE BIENNIAL REPORT.

Clothed in an attractive colored cover showing a mountain lion in wait for deer, the Twenty-fourth Biennial Report of the Fish and Game Commission is off the press and ready for distribution. The report covers the period from July 1, 1914, to June 30, 1916, and gives in detail the work accomplished by the commission.

The main body of the report, which is a summary of the activities and accomplishments of the commission, is followed by departmental and district reports and by an appendix giving a roster of employees, an inventory of state property, the distribution of fish by counties, the distribution of game birds, and full statistics on lion bounties paid, seizures of fish and game and illegally-used fishing apparatus, violations of fish and game laws, hunters and anglers license sales, and receipts and disbursements. Nearly one hundred halftones illustrate the report. Conspicuous among these illustrations are pictures showing the work of the deputy, a series showing how fish are transported from the hatchery to the stream, seining fish from overflowed districts in the San Joaquin Valley, feeding quail during severe winter weather and various fishways, screens and hatchery buildings.

The report clearly shows that the past biennial period has been one of marked advance in the protection and preservation of wild life, the propagation of fish, the stocking of streams, the construction of fish ladders and screens, and above all, in the accumulation of data on fish and game and the development of a public sentiment favoring wild life conservation. All of the duties of the commission, as above outlined, have been performed as fully and faithfully as the financial and other resources have allowed.

More arrests have been made and more convictions obtained in this than in any previous biennial period.

Educational and publicity work has been largely augmented and one department gives almost its entire time to work of this kind.

The game refuges of the state have been enlarged by the addition of 782,998 acres of national forest lands, which were set aside by the last legislature.

The new and amended fish and game laws of the 1915 legislature have proved to be important conservation measures. Noteworthy in this legislation was the elimination of "bull hunting," the changing of the laws to accord with the Federal Migratory Bird Law and the shortening of seasons and lowering of bag limits.

Large numbers of deer and quail were saved from starvation during the severe winter weather of 1916.

Through the payment of 162 lion bounties in 1915 and of 111 during the first six months of 1916, thousands of deer have been saved from death at the hands of these predators.

Sixty-eight assistants or deputies have carried on active patrol duty, and although some of them patrol areas greater than the state of Vermont, yet wild life has been safeguarded to a remarkable degree.

Sufficient fish were liberated during the year 1915 to furnish every resident of the state with sixteen fish. The hatcheries and egg collecting stations have been operated to their full capacity and the streams of the state are already showing the result.

The department of commercial fisheries, established in 1914, has accumulated important data on the fisheries of the state and has been instrumental in aiding in the development of certain neglected fishery resources.

The attainments recorded in the twenty-fourth Biennial Report indicate that much has been accomplished during the period from July 1, 1914, to June 30, 1916, towards the conservation of fish and game resources in the state of California and that the people of the state may justly be proud of the board which administers these resources. Certainly no other fish and game commission has accomplished more in the same period of time.

HOW LONG?

How long! How long, will the people of the state of California allow officers in state employ to be murdered by aliens, many of whom go unpunished?

Several years ago Bert Blanchard, a deputy of the Fish and Game Commission, was found dead in the hills of Contra Costa County. He had been shot by some hunter, probably an alien. Some years after Ernest Reynaud, another deputy of the commission, was killed by Italian fishermen near Greenbrae. Mr. Reynaud, along with M. S. Clark, had arrested two Italian fishermen. When a third Italian was taken into the boat as interpreter a fight followed, with the result that Mr. Reynaud was killed and Mr. Clark, being thrown out of the boat, only succeeded in saving his life by swimming to shore. Fortunately the man responsible was apprehended and sent to San Quentin for life. Soon after Deputy Frank P. Cady of Susanville was shot in the leg by an Indian violator. In the discharge of his duties Deputy George J. Rodolph was shot by two market hunters near Los Banos. The guilty man was acquitted by a jury and his companion was discharged on a preliminary examination.

As we go to press word comes that Deputies Ray Heacock and Richard Squire were murdered by aliens on Bouldin Island near Terminus, San Joaquin County. Deputy Squire was found in the boat, shot through the head and the boat and his clothing riddled with bullets. The body of Deputy Heacock has not been found at the date of writing. Earlier the same night two white fishermen, at the point of revolvers, were told to move on by four Italian fishermen. The same men later killed these two deputies while they were in the discharge of their duties.

Pennsylvania's answer to outrages of this kind was a law prohibiting the carrying of firearms by aliens. At the time this law was passed it was pointed out that a very large percentage of all the murders in Pennsylvania were committed by aliens. The measure was, therefore, a measure not only to more largely protect fish and game, but to protect human life. Will California take the same steps to stop crimes of this sort?

THE CLOSED SEASON.

The coming few months are especially set aside as a closed season when no hunting whatever is allowed. The most fundamental law of conservation is that animals must be protected during the breeding season. If the parents are killed at this time the young are left to starve. Animals during the breeding season become remarkably tame and the killing of them at this time is not sport but wanton murder. Do your share to protect all wild life on its breeding grounds and see that all your friends and neighbors do likewise.

BOY SCOUT COOPERATION.

Believing that many of our readers will be interested in seeing what boy scouts in this state are doing for the conservation of wild life we are instituting a department in which the scouts will have a chance to demonstrate their work. Only a beginning has been made in this cooperative work and we may expect to see a steady improvement in the output of the boys.

The Fish and Game Commission is endeavoring to do its share by furnishing free stereopticon lectures to the different troops.

HEAVY PENALTY IMPOSED FOR SMUGGLING DUCKS.

A. L. Mason, of Los Banos, was arrested and fined $500 and sentenced to 150 days imprisonment for attempting to smuggle ducks to the San Francisco markets. Mason had 457 ducks in a small machine, and was headed for San Francisco, when by merest chance he was apprehended. He appealed to Night Watchman Michael Collins of Redwood City to help him fix a blow-out, and in the search for a new inner tube the ducks were uncovered. The sentence, imposed by Justice of the Peace George Seely of Redwood City, is the heaviest on record for an offense of this kind.

THE FOOD OF DUCKS IN CALIFORNIA.

If increase of food supply means increased numbers of a game species, it is reasonable to believe that were it possible to furnish artificially additional food for waterfowl, greater numbers would not only be attracted to this state, but many would doubtless remain and breed. The

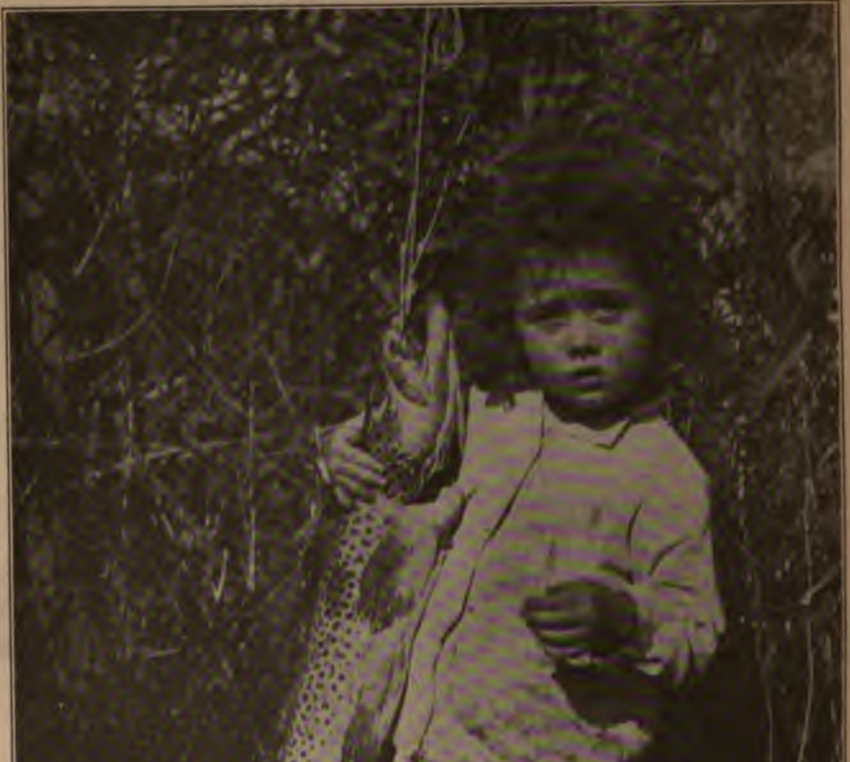


Fig. 3. Large Loch Leven trout taken in the Owens River by Guy H. Dusenbery of Bishop, Inyo County. Photograph by J. H. Von Blon.

The large Loch Leven trout shown above was taken in the Owens River, about twelve miles north of Bishop, Inyo County, by Mr. Guy H. Dusenbery in November, 1916. A huge hook—probably an Indian's—was found imbedded in its jaw. Probably as a result of this hook the fish was of light weight considering its size. In good condition it would probably have weighed eight pounds. The size of the fish is remarkable in that Loch Leven trout planted by the Fish and Game Commission in the Owens River but seven years ago. The weight of this fish, therefore, indicates a growth of approximately a pound a year.

inroads on the natural food supply made by reclamation can be counterbalanced by artificial planting of those plants furnishing food for waterfowl. More and more interest is being taken in this conservation measure.

To the man or the club seeking information on the proper food plants to grow we recommend the following bulletins:

Three important wild-duck foods, U. S. Dept. Agric. Bur. Biol. Surv., Circ. 81, pp. 1–19.
Five important wild-duck foods, U. S. Dept. Agric. Bull. 58, pp. 1–19.
Eleven important wild-duck foods, U. S. Dept. Agric. Bull. 205, pp. 1–26.

All of these bulletins deal more largely with Eastern conditions, however, and nothing but experiment will demonstrate the value of many of the species for our conditions. In order that more detailed information be available for Californians, the Bureau of Education, Publicity and Research of the Fish and Game Commission has begun an investigation into the food of wild ducks. Hundreds of stomachs have been collected and the contents of these are being analyzed and the results tabulated. Already nearly a hundred stomachs have been examined. When the investigation is completed, evidence as to the seeds, roots and bulbs most often fed upon by the different species of wild ducks will be at hand. It will then be possible to make better recommendations as to the best native food plants to grow in order to attract waterfowl.

STATE FAIR EXHIBIT.

The Fish and Game Commission maintained an extensive and interesting exhibit at the California State Fair, held at Sacramento during the early part of September. Owing to the greatly increased number of exhibitors at this year's fair, the space allotted the commission's exhibit was not as much as desired, but, fortunately, was so located as to be directly in front of the main entrance and in the path of the thousands of visitors, both when entering and leaving the grounds.

A unique octagonal pavilion, forty by forty feet, was constructed of fish nets that had been confiscated from fishermen using them in an illegal manner. An additional lot of confiscated nets, making a pile twelve feet high by twenty feet wide, was shown on the outside of the pavilion.

Large aquaria showing splendid adult specimens of various species of trout, also troughs showing the propagation of trout from the egg to the time when the young fish are liberated, attracted much attention.

All of the species of trout to be found in this state were shown in jars, also some twenty-five species of freshwater fish taken from the San Joaquin and Sacramento delta districts, together with photographs showing deputies of the commission engaged in seining and distributing these fish. Portable pens containing pheasants, quail and deer from the State Game Farm at Hayward, together with mounted specimens of birds and mammals, did much to complete the attractiveness of the exhibit.

There were photographs of the fish hatcheries, the fish distribution car, and a series of splendid pictures showing the work done by the commission in collecting and distributing golden trout to the almost inaccessible lakes and streams of the high Sierras by means of mule pack train. Fish-culturists of the commission were in attendance to explain the artificial method of propagation. The thousands of people who viewed the exhibits went away with a better understanding of the splendid work that is being accomplished by the California Fish and Game Commission.

PRACTICAL EDUCATION.

The Irving School of Riverside, Riverside County, has received the honor of being listed by the New York Audubon Society as one of the ten schools in the United States "standing highest in the contest relating to the identification of local and migratory birds." The fifth grade of the school sent in a list of eighty-one species of birds observed in the near vicinity. Hundreds of schools in the United States entered the contest.

To increase the appreciation of California's many songbirds, the San Diego County Board of Education requested all grades and high schools to give particular study to birds from November 6 to 17, as preparation for a contest based on compositions written on the following

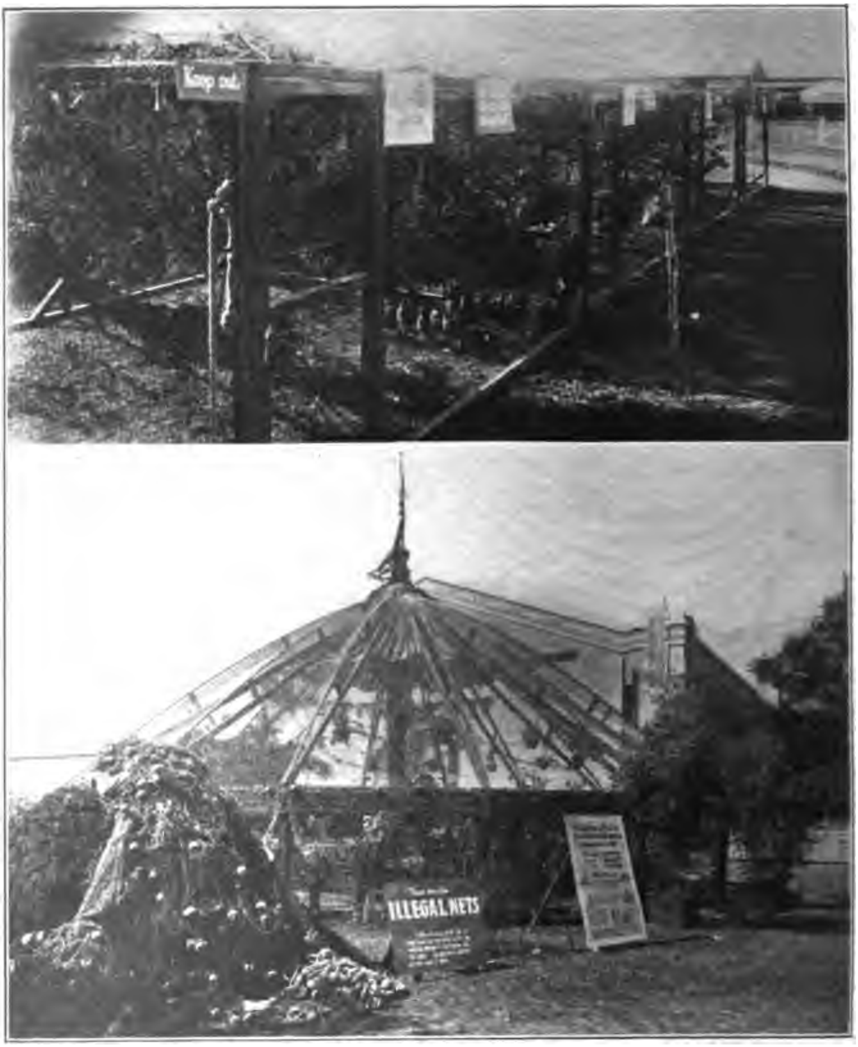


Fig. 4. The Fish and Game Commission exhibit at the State Fair, September, 1916.

subjects: "What I observed in one week," "Bird nests," "Mountain birds," "Our most useful songsters," "Sea birds," and any subject requiring keen observation. The papers were graded on quality and the length of each was left to the discretion of the teachers.

The exposition company offered 100 free admissions for the best 100 papers, and 15 medals for the best 15 papers. Papers were graded by November 14 and the best compositions chosen from every grade and one from every class in the high school. The best products of the art department, showing birds, were exhibited at the exposition, and remained through Bird House Day celebration, held December 15. The commercial departments exhibited designs, the sewing classes exhibited bird embroideries and the music classes sang bird songs.

In our opinion, studies of this kind are of far more value than many of the prescribed courses of study. A child that is "taught to read a roadside as well as to read a book" is worth more to himself and more to the community in which he lives.

THE TREATY WITH CANADA.

Conservationists the country over are rejoicing because of the passage of the Canadian Treaty, which supplements the Federal Migratory Bird Law. The following is a summary of the main provisions:

1. That no bird important to agriculture because of insect-destroying proclivities shall be shot at any time.
2. That no open season on any species of game birds shall extend for a longer period than three and one-half months.
3. That both countries shall so restrict open seasons on game birds as to prevent their being taken during the breeding season.

4. That there shall be no shipment from one country to the other of birds which are taken contrary to law.

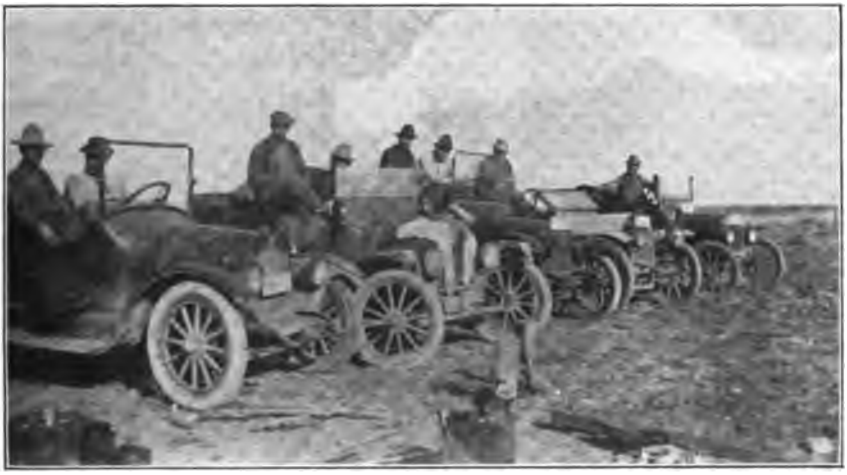


Fig. 5. Deputies of the Fish and Game Commission at work in the marshes of the San Joaquin Valley. From left to right are deputies Smalley, Brownlow, Smith, Maloney, Kimball, Squires, Hoen and Matthews. Photograph by J. E. Newsome.

The treaty is to remain in force for fifteen years and will continue in force beyond that time, provided the contracting powers do not give twelve months notice of a wish to terminate it.

MIGRATION RECORDS.

Many people in Eastern states obtain considerable pleasure by making notes regarding the arrival and departure of birds. Few people in California systematically record arrivals and departures and consequently miss the elation as evidenced in a card recently received from one of our readers.

"Winter Resorts.

"SOCIAL ITEMS.

"Mr. Robin has arrived at the Lastreto Woods, Atherton, and was very busy investigating conditions and making arrangements for Mrs. Robin and his numerous family preparatory to their customary winter sojourn. His rotund form was visible on Tuesday morning, the 7th inst."

Probably few others in the vicinity of Atherton, San Mateo County, even noticed that the western robin had returned for his winter stay. Ignorance regarding bird life in California is great even among people of leisure. We trust that as years go by a keener interest will be taken in our bird life and that instead of receiving a single notice of the arrival of a winter visitant, hundreds of cards will furnish data to show the southward progress of the different species from day to day. If any of our readers are looking for a stimulating hobby let them turn their attention to the recording of the arrival and departure of migratory birds.

GOAT ISLAND BECOMES NATIONAL GAME PRESERVE.

The Fish and Game Commission has for several years past liberated pheasants and quail on Goat Island in San Francisco Bay. Both pheasants and quail have been doing well. Due to the efforts of Captain Andrews, formerly commandant of the Naval Training Station situated on the island, who took an active interest in these birds, the island has been declared a federal game preserve.

The executive order, signed by President Woodrow Wilson, is as follows:

> It is hereby ordered that Goat Island, containing about one hundred and forty-one acres of land, situated in San Francisco Bay, approximately midway between the cities of San Francisco and Oakland, Cal., shown upon Coast Survey Chart No. 5531, and as segregated by the broken line upon the diagram hereto attached and made a part of this order, is hereby reserved and set apart for the use of the Department of Agriculture as a preserve and breeding ground for native birds, subject, however, to the use of the island for naval, military and lighthouse purposes in conformity to requirements of executive orders heretofore issued.
>
> It is unlawful for any person to hunt, trap, capture, wilfully disturb, or kill any bird of any kind whatever, or take the eggs of such bird within the limits of this reservation, except under such rules and regulations as may be prescribed by the Secretary of Agriculture.
>
> Warning is expressly given to all persons not to commit any of the acts herein enumerated under the penalties of section 84 of the United State Criminal Code, approved March 4, 1909 (35 Stat. 1104).
>
> This reservation to be known as San Francisco Bay reservation.
>
> WOODROW WILSON.
>
> The White House, August 9, 1916.

A TAMALPAIS GAME REFUGE A POSSIBILITY.

Large holdings on the northern watershed of Mount Tamalpais have been purchased by the Marin Municipal Water District. Much of this territory was formerly leased by the Lagunitas Rod and Gun club and game is very plentiful. Fearing that the opening of this area to the public would have the effect of destroying the game and thus taking pleasure from those who will use this territory for outings, a movement is on foot to make of this land a state game refuge, either under the section which allows the creation of reservations on private lands or by legislative enactment. Congressman William Kent, who is backing the scheme, has offered to contribute a sufficient sum to police the refuge.

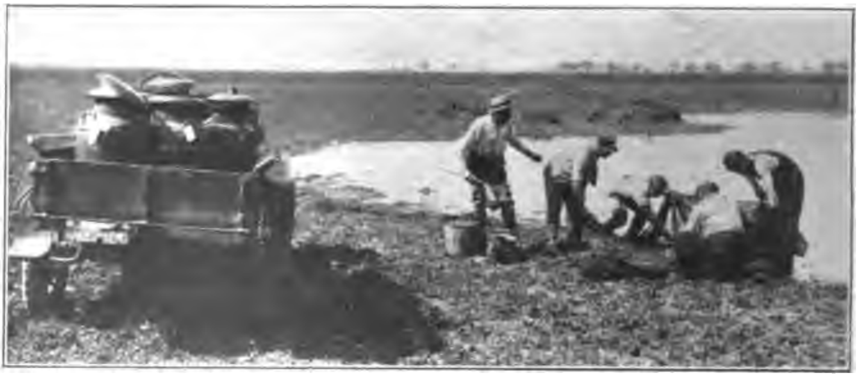


Fig. 6. Saving fish from overflowed areas in the Yolo Basin. **The fish saved from death in this way are planted in other streams of the state. Photograph by McCurry Company,** August, 1916.

TURKEY BUZZARD AND DISEASE.

Support for our contention that the turkey buzzard can not be considered a serious menace so far as its disease-carrying proclivities are concerned, as reported in CALIFORNIA FISH AND GAME for October, 1915 (Vol. 1, page 222), has come in a recent bulletin of the United States Biological Survey (Common birds of southeastern United States in relation to agriculture. Farmers Bull. 755). On pages thirty-eight and thirty-nine of this bulletin Mr. W. L. McAtee makes the following defense for the buzzard:

> The turkey buzzard now is threatened with persecution in the land where heretofore it has received the most zealous protection, for the bird has been accused of spreading such diseases of live stock as hog cholera and anthrax. The charge that it spreads hog cholera has never been demonstrated, and until this is done

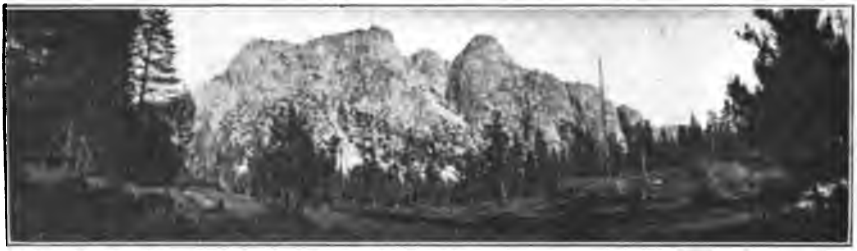


Fig. 7. Kern Buttes at mouth of Volcano Creek, a stream noted as the home of the golden trout. Photograph by A. D. Ferguson.

judgment should be suspended. Its relation to anthrax has been investigated, with the result that in the distribution of the disease the bird must be considered a minor agency as compared with man and various domestic and certain wild animals.

The nature of their food would indicate that buzzards have strong digestive powers. The spores of anthrax, or charbon, a virulent stock disease, have been shown by two independent investigations to be destroyed by passing through the alimentary canals of buzzards. Anthrax spores are not destroyed in the digestive tracts of other carrion-feeding animals, as the dog, cat, hog, chicken, or opossum.

It is true that buzzards may carry the germs of anthrax or other stock disease on their plumage, feet, or bills, and thus distribute them; but all the other animals just mentioned may similarly carry disease germs on the surfaces of their bodies, as may also flies, domestic pigeons and other poultry, horses, mules, and cattle, not to mention members of the human family. In fact, at the same time that steps are being taken greatly to reduce or exterminate a wild bird—the buzzard—which may possibly play a minor part in the transmission of anthrax, farmers are harboring several domestic animals that have far greater possibilities as spreaders of the disease. The fact that anthrax may be carried by flies is more than sufficient to explain the most severe epidemics.

Obviously, it is unfair to attempt to place the blame for general dissemination of stock disease on the buzzard. Considering the multitude of ways in which these diseases may be spread, it can not be doubted that stock diseases would be as widely distributed as now if turkey buzzards were eliminated, as has been proposed. What amounts to proof of this is the fact that hog cholera at times is virulent and seriously destructive in regions where there are few or no turkey buzzards, as in certain northern states and Canadian provinces.

HABITS AND FOOD OF THE ROADRUNNER IN CALIFORNIA.

Results of further investigations of the economic status of nongame birds instituted by the Fish and Game Commission in 1911 have just been published under the title: "Habits and food of the roadrunner in California." (Univ. of Cal. Pub. Zool., vol. 17, no. 5, pp. 21–58, pls. 1–4, 2 figs. in text). For many years sportsmen have accused the roadrunner of destroying the eggs and young of valley quail and a study of the food habits of the bird was ordered. The contents of many stomachs of roadrunners were analyzed, but the results as shown by the following summary do not show the roadrunner to be a serious enemy of valley quail or other birds. Many specimens were secured in localities where quail were breeding but these showed no evidence that quails' nests had been disturbed.

The roadrunner (*Geococcyx californianus*) is unique in many ways. Of particular interest are its breeding habits

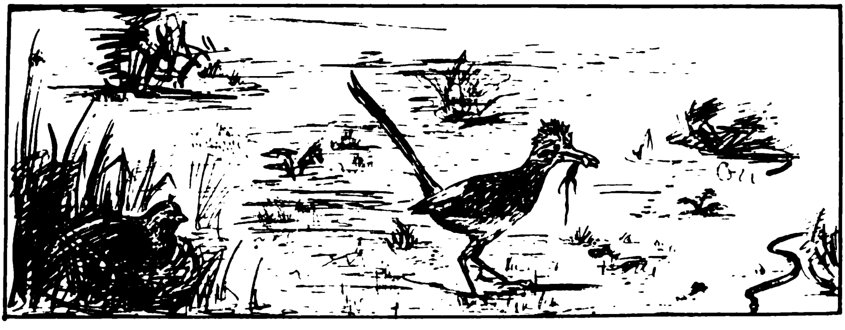
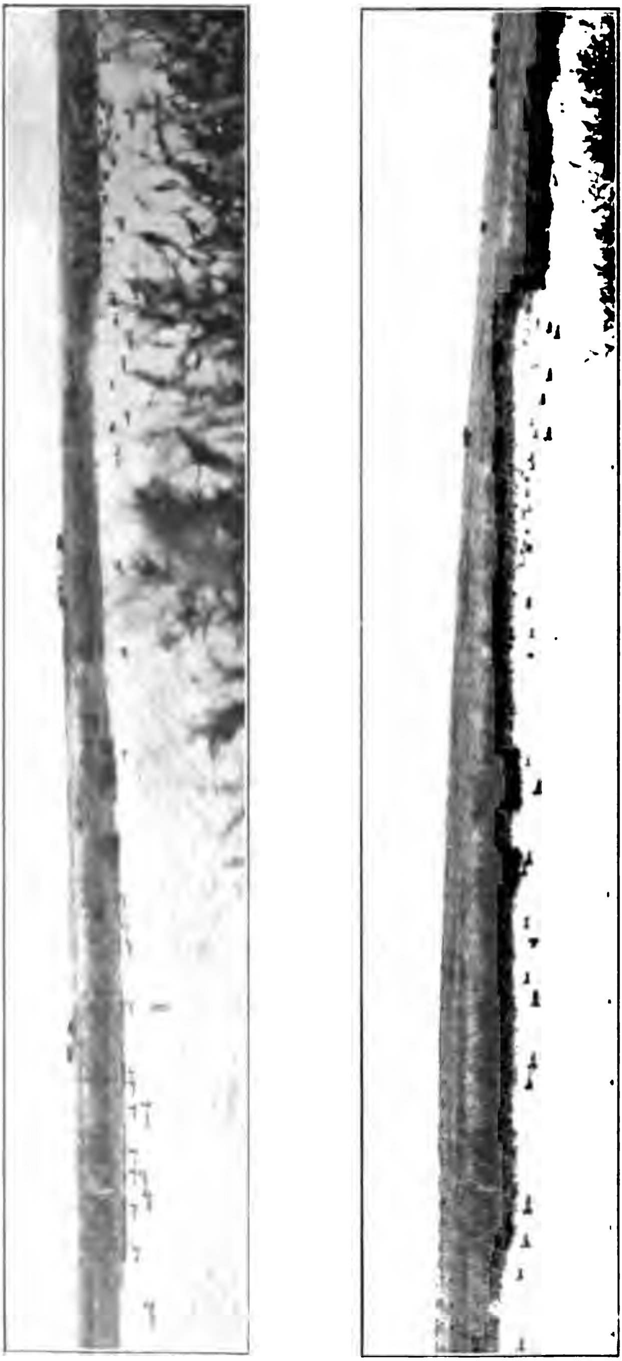


Fig. 10. Apparently the roadrunner has been falsely accused of destroying the nests and eggs of valley quail. Stomach examination has shown that insects, mice, lizards and snakes



Figs. 8 and 9. Waterfowl in the marshes of Fresno County. Photographs taken on the Thornton Ranch in southwest Fresno County by E. W. Smalley, July, 1916.

and especially food habits. It is doubtful if an investigation of the food habits of any other American bird could have yielded such spectacular results.

The investigation here reported upon included analysis of eighty-three stomachs of roadrunners taken in southern California in 1911 and 1912 and also a survey of all available literature relative to the food of the roadrunner in California.

The eighty-three stomachs represented birds taken every month of the year with the exception of March. The analysis of the stomach contents showed that practically 90 per cent (90.07%) of the total food was made up of animal matter and that slightly less than 10 per cent was of vegetable material. Nearly all of the vegetable matter was of one kind, the fruit and seeds of the sour berry (*Rhus integrifolia*). Insects and certain vertebrates composed the animal food. Chief among the insects found were beetles (18.2 per cent), grasshoppers and crickets (36.82 per cent), cutworms and caterpillars (7 per cent), cicadas and other hemipterous insects (5 per cent), ants, bees, and wasps (4.24 per cent), and scorpions (3.67 per cent). Lizards of three species (3.73 per cent), one bird (1.56 per cent), and two wild mice of two different species, composed the vertebrate food.

The results of stomach examination substantiated rather than altered published statements regarding the food of the roadrunner. From published sources, however, came added information as to the number of snakes and lizards consumed by this bird and practically all of the information regarding its bird-eating habits. One lizard, the whip-tailed lizard (*Cnemidophorus*) appears to be eaten more often than any other species.

The roadrunner's individual capacity for food is great, for an average full stomach contains about ten cubic centimeters of food. The collective capacity, however, is small, due to fewness of individuals. The amount of damage possible (and this must be said also of the potential good) is greatly minimized because there is no concentration of individuals in any one place. A wide variety of food items from small insects to reptiles and mammals is consumed.

Little evidence was obtained that the roadrunner is detrimental to man's interests. The destruction of a few beneficial insects and birds, and of certain lizards usually considered beneficial, can alone be taken as evidence against it. Even if the consumption of a certain proportion of all of the above as food be a fixed habit, the end result is minimized when the facts are taken into consideration that the roadrunner is a bird of the desert regions rather than of the cultivated fields and that the species exists in but small numbers.

A preponderance of evidence favors the bird. The destruction of such unquestioned pests as grasshoppers, cutworms, caterpillars, and wireworms, and of such rodents as mice is to be desired even if the amount of destruction be relatively small. The taking of this sort of food on wild land is evidence that this bird when feeding in cultivated fields is likely to be distinctly beneficial.

Evidently the roadrunner never turns its attention to any sort of cultivated crops as do those birds with granivorous and frugivorous habits. On the contrary, a study of its food habits shows that the roadrunner feeds upon the insect and rodent pests which attack cultivated crops, and furthermore that it destroys hairy caterpillars, a pest not commonly attacked by other birds.

The investigation has also shown that the bird-eating habit of the roadrunner has probably been exaggerated and that the killing of the roadrunner by man as an injurious species is unjustified. The benefits conferred by the roadrunner in

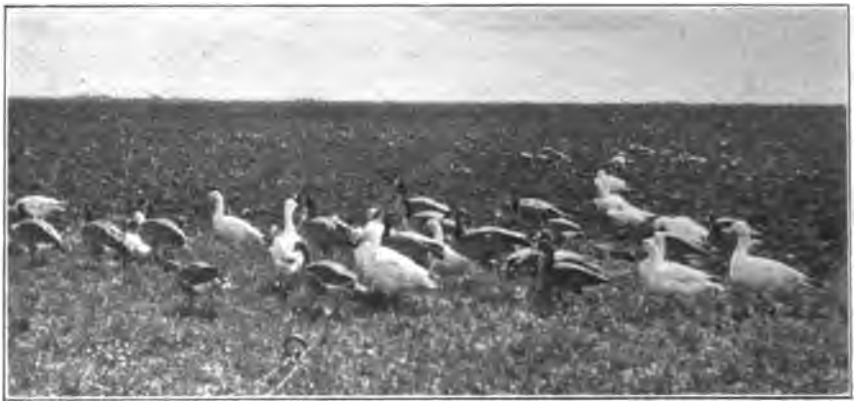


Fig. 12. Decoy geese. Property of "Goose" Lewis of Dixon, California. Photograph by George Neale, May, 1916.

the destruction of insect and rodent pests plus its esthetic value leaves a balance distinctly in favor of the bird and marks it as a beneficial rather than an injurious species.

A "PAT ON THE BACK."

We have scrupulously refrained from publishing the many letters praising the work of the commission which come to the editor's desk, but the following editorial from the Ukiah *Times* for November 1, 1916, is such a fine appreciation that we can not refrain from giving our readers a chance to see it. Such a "pat on the back" is certainly encouraging.

GAME COMMISSIONERS DOING VALUABLE WORK.

"Through the courtesy of the State Board of Fish and Game Commissioners a copy of CALIFORNIA FISH AND GAME for October lies on *The Times* desk. It is the official monthly publication of the commission and the latest issue is the fourth number of the second volume. Not only is the board to be complimented on the contents of the October issue, but the editorial staff deserves commendation for the typographical makeup and neat appearance of the pamphlet.

"When the public realizes that all the commissioners are engaged in a labor of love, serving without financial consideration, the energy, judgment and hard work which they are throwing into their official task will be seen to entitle them to be regarded as mighty faithful servants of the people; this means of the public as a body, for while sportsmen are most keenly interested in the work of the commission, the propagation and conservation of game form a state asset, in the benefits of which every citizen figures.

"Inasmuch as the commissioners draw no salary, *The Times* is of the opinion that they should at least be made to feel that in a measure their reward lies in public appreciation of the value of their services. They are engaged in a large and important work, and the intelligent and faithful performance of their duties will prove of immense value to the state."

OBTAIN AN AUTHORITATIVE WORK ON PHEASANT BREEDING FREE.

Through the courtesy of the American Game Protective Association we are enabled to offer free of charge to game breeders in this state a limited number of copies of E. A. Quarles' authoritative work "American Pheasant Breeding and Shooting." Everyone engaged in pheasant breeding and everyone who contemplates rearing these birds should possess a copy of this book. Make application to Bureau of Education, Publicity and Research, Museum of Vertebrate Zoology, Berkeley, Cal., and include six cents in stamps to cover postage.

GAME BIRDS FOR SALE.

The stock of game birds at present held on the State Game Farm at Hayward will be sold at reasonable prices to game breeders. The species represented are: ring-necked, golden and silver pheasants and valley quail. Ducks of the following species are also offered: mallard, pintail, spoonbill, cinnamon teal, green-winged teal and fulvous tree-ducks. Apply to Superintendent, State Game Farm, Hayward, Cal., for prices.

HATCHERY NOTES.

W. H. SHEBLEY, Editor.

COMPLETION OF HATCHERY OPERATIONS FOR THE SEASON 1916.

On November 7, the fish distribution car left Sisson with the last shipment of trout fry for southern California, and this completed the work of the hatcheries for the season of 1916. While the total number of trout fry distributed during the season of 1916 has been less than during 1915, we believe that, taken as a whole, the results have been more satisfactory. We were able to give the fish a wider distribution this season owing to the fact that we had more hatcheries in operation and were better equipped to hold and rear the fry at the smaller stations. With the improvements made at Bear Valley and Snow Mountain stations, and the construction of Fort Seward and Almanor hatcheries, our facilities for rearing and distributing trout fry have been greatly increased. With Sisson hatchery relieved of a portion of the work of hatching, rearing and distributing the fish, overcrowding of the fry in the hatching troughs was avoided to a considerable extent and as a result those distributed this season were stronger, healthier fish and reached the streams in better condition than in former years.

Improvements made in our distribution car 1, the installation of a larger and more efficient engine and air compressor in car 2 and a better system of the distribution of air in the cans on both cars have been contributing factors in the successful results obtained in fish distribution work this year.

From Sisson hatchery we distributed 1,950,000 rainbow, 1,850,000 eastern brook, 1,725,000 Loch Leven, 950,000 black-spotted, 2,800,000 steelhead and 75,000 German brown, a total of 9,350,000 trout fry.

From Tahoe hatcheries, 209,000 rainbow, 50,000 eastern brook, and 2,765,000 black-spotted, a total of 3,024,000 trout fry, were distributed.

Steelhead trout fry to the number of 490,000 were distributed from Ukiah hatchery and 184,000 steelhead fry from Snow Mountain station.

From Fort Seward hatchery there were distributed 95,000 rainbow, 132,000 black-spotted and 924,000 steelhead, a total of 1,151,000 trout fry.

From Almanor hatchery 202,000 rainbow trout fry were distributed.

From Brookdale hatchery 881,000 steelhead fry were distributed, from Bear Val-

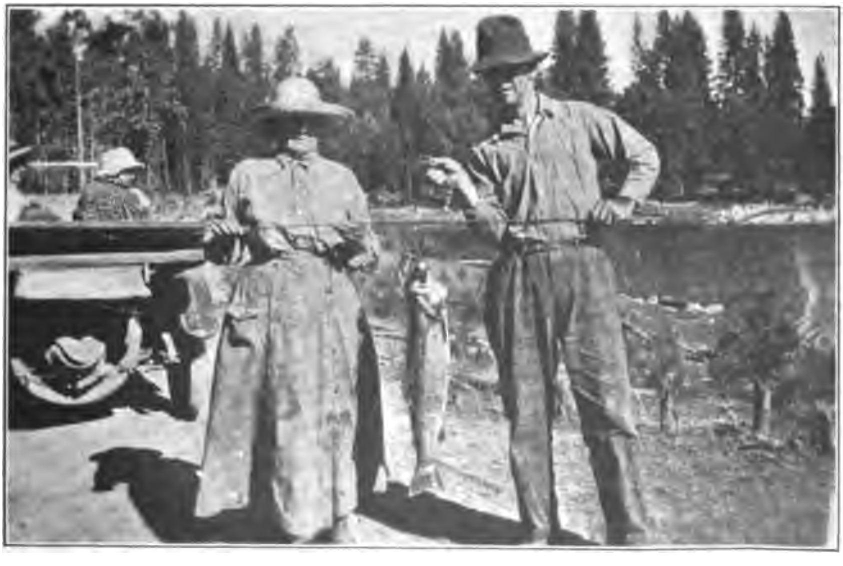


Fig. 13. A rainbow trout, 29½ inches in length. Caught by Mr. and Mrs. Frank Mason of Fresno, at Bass Lake, Madera County. Photograph by R. S. Kimball.

ley hatchery 750,000 rainbow, and from Marlett-Carson hatchery 55,000 eastern brook, making a total number distributed from all of our hatcheries of 16,087,000 trout fry.

A NEW FOOD AND GAME FISH FOR SOUTHERN CALIFORNIA COAST COUNTIES.

During the early spring of 1916 we endeavored to obtain a supply of small striped bass for the southern California coast county streams by seining in San Pablo Bay.

On May 28 a shipment of about 300 small striped bass were obtained and shipped to Senator E. S. Rigdon of Cambria, San Luis Obispo County, who liberated them in Morro Bay at the mouth of Chorro Creek. Several times through the summer months an endeavor was made to continue this work, but weather and tide conditions were not favorable and efforts were not successful. The work was again taken up during the middle of October and, as conditions were favorable at that time, a fine shipment was procured. The seining operations were carried on near Vallejo under the supervision of Deputy H. E. Foster. Deliveries were made to Senator Rigdon, who planted 600 striped bass in the mouth of San Luis Creek, at San Luis Bay, and 400 at the mouth of Corral de Piedra Creek near Pismo, in San Luis Obispo County. The Los Angeles division of the Fish and Game Commission received 2,200 striped bass, and 200 of these were liberated in Anaheim Bay and 2,000 in the lagoon at Sunset Beach, Orange County. A third consignment consisting of 1,800 striped bass was delivered to H. R. Asher, secretary of the San Diego Rod and Reel Club, and liberated in Mission Bay, San Diego County. If the results of these plantings of striped bass are successful, a new and valuable game and food fish will be added to the waters of southern California.

SCREEN AND LADDER OPERATIONS.

During the past two or three months considerable progress has been made in the installation of fish ladders. The following is a list of the ladders that have been completed, which have not been heretofore reported:

The Valdor Mining Company has completed the construction of a fishway over its dam in Canyon Creek, Trinity County.

The same company has installed a screen in its canal diverting water from Canyon Creek, Trinity County.

A fish ladder has been completed over the dam of the Northern California Power Company in Tehama County, at Inskip Ditch, below south power house.

Under the supervision of Deputy J. S. White, a fish ladder has been installed over the Butters Dam, in Big Backbone Creek, in Shasta County.

A ladder has been installed over the Ellsworth Dam in Campbell Creek. This dam is the property of Santa Clara County.

William Shaughnessy has completed the construction of a fish ladder over his dam in Sierra County, in the south branch of Middle Yuba River.

The dam of C. J. York, in Middle Yuba River, Sierra County, has been provided with a fishway.

Overflow and underflow current fish ladders are now under construction over the Mendota Weir, in San Joaquin River, Fresno County. This weir is the property of the Miller & Lux Company.

The Crown-Willamette Paper Company has commenced the construction of a new fish ladder over the Floriston Dam, in Truckee River, Nevada County.

A fish ladder is being installed over the dam of the Anderson Irrigation Project, in Sacramento River, Shasta County.

From recent reports received from Santa Clara County, we find that screens have been installed in irrigation ditches of J. W. Dickson, diverting water from Penitencia Creek; M. D. Knoble of Berryessa; P. Mason of San Jose; G. W. Page, diverting water from Campbell Creek; Sorosis Fruit Company, Campbell Creek; and La Hoydie Irrigation Company, Campbell Creek.

Two new screens have been installed by the Trinity Gold Mining and Reduction Company, in Trinity County. The Western States Gas and Electric and the La Grange Company have screens ready for installation in their ditches in Trinity County as soon as the water is turned in next spring.

A screen has also been installed in a ditch diverting water from the east fork of Stewart's Fork of Trinity River, Trinity County, by Mrs. A. Baudrey.

The California-Oregon Power Company is planning to install a large screen of special construction in its canal diverting water from Shasta River, Siskiyou County.

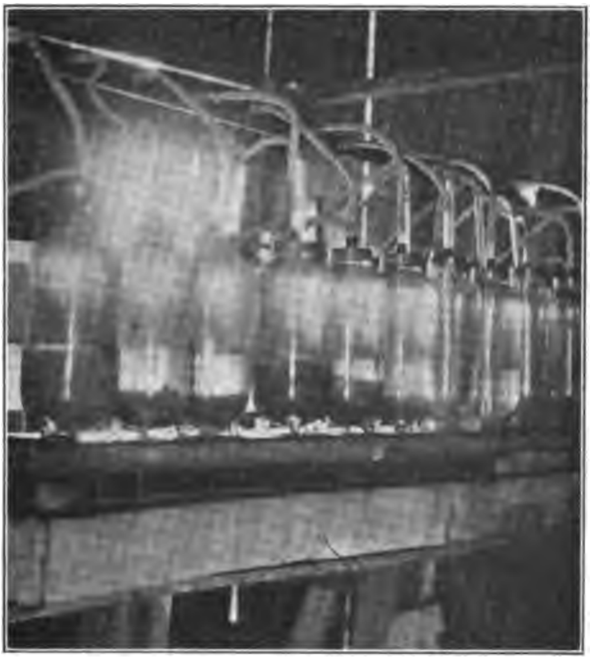


Fig. 14. A "shad battery" at Yuba City hatchery. The photograph clearly shows the manner in which shad eggs are hatched.

PREPARATIONS FOR NEXT SEASON'S HATCHERY OPERATIONS.

The construction of Fort Seward hatchery, Humboldt County, is nearly completed and we expect to have the station in first-class shape for salmon hatching operations this season.

Improvements have been made in the hatchery building by the installation of new hatching troughs. The hatching troughs and the building inside and out have been painted. The superintendent's residence has been completed and additions to living quarters for assistants have been made.

Fort Seward hatchery will be well equipped for handling both salmon and trout. We will be able to rear enough trout at this station to keep the streams of the north coast counties well stocked, and it is our intention to also propagate enough salmon fry to keep up the supply of this valuable commercial fish in Eel River.

Work has been completed for the season on Almanor hatchery located at Lake Almanor, Plumas County. A hatchery building 22 feet by 40 feet, equipped with sixteen hatching boxes and all necessary paraphernalia for operating the hatchery next season, and comfortable living quarters for the employees have been constructed. A large fish-holding tank, fish racks, flume and trap have been built and stored ready for installation as soon as operations are commenced in the spring. The work was finished on November 17.

A small eyeing station consisting of ten hatching troughs has been installed at Domingo Springs.

A large fish-holding tank, racks, flume, trap, etc., have been built and tools and egg collecting apparatus are stored at Rice Creek Spawning Station, near Domingo Springs, ready for installation as soon as operations are commenced. The necessary tent, cook stove and complete camp equipment have also been stored at Rice Creek station and Domingo Springs.

During the latter part of September the construction of the Rae Lakes egg collecting station was completed. Materials, supplies, tools, etc., were taken to the lake over the Oak Creek Pass and stored in a firmly constructed galvanized iron building 8 feet by 14 feet, which was built during the summer. A supply of provisions was also cached to be used by the assistants next spring when they make the trip in to commence the egg collecting work. Rack and trap material was also taken into the station and preparations made for installing the paraphernalia when egg collecting operations are commenced. It was necessary that absolutely every article for the operation of the station, as well as camp equipment and food for the men engaged in the work, be foreseen and taken in during the summer, as the assistants will have to go into the station next spring over the Oak Creek Pass, via Diamond Peak, the highest point of which is over 12,000 feet, and will be able to pack only their blankets with them.

The rainbow trout eggs taken at Rae Lakes station will be hatched and reared at the new hatchery now under construction on Oak Creek, Inyo County, from which point they will be distributed in the streams of southern California.

On October 1, operations were commenced in an endeavor to obtain a supply of eastern brook trout eggs from Marlett Lake, Nevada. The California Fish and Game Commission and the Nevada State Fish Commission entered into an agreement to cooperate in the work and divide the eggs secured equally between the two commissions. The eggs are taken from tributaries of Marlett Lake, near the lake shore and from Hobart Creek at Red House and transported by teams to Verdi hatchery, where they are eyed and prepared for shipment to Sisson hatchery. Heavy rain and snow storms set in, however, and it was not until October 12 that our assistants were able to leave Carson City, Nevada, on the trip into Marlett Lake. On account of the heavy fall of snow, which was from one to three feet deep, they were unable to get farther than Red House. Temporary camp was made at this place and on the fifteenth the crew went on to the lake on snowshoes. Marlett Lake was found to be covered with a thin coat of ice. As no fish were running, due to the heavy storms and cold weather, the crew returned to Red House, where a few trout were running in Hobart Creek, and where racks and trap had been installed. On the seventeenth, camp was moved to Marlett Lake and racks installed in the largest stream flowing into the lake. The run of

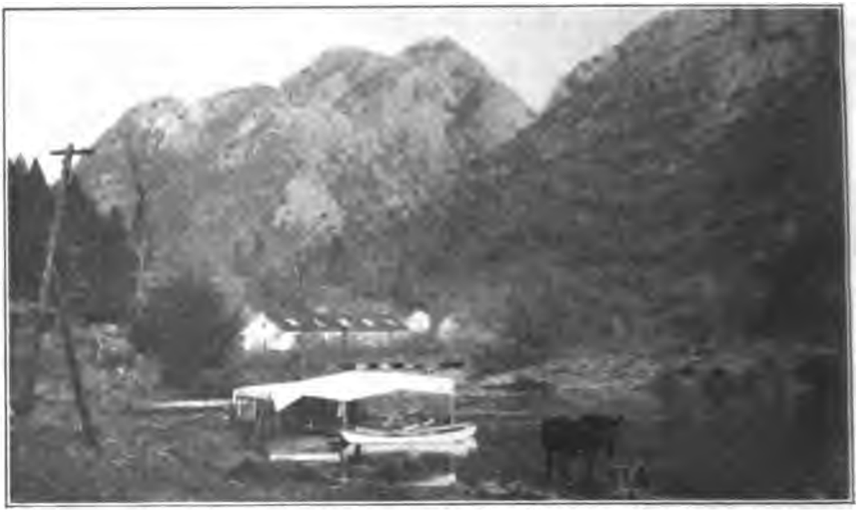


Fig. 15. The McCloud River station of the United States Bureau of Fisheries. It is here that most of the salmon eggs are secured for stocking the streams of California.

spawning fish soon started, but owing to the continuance of the storm and extremely cold weather, the runs at both Marlett Lake and Hobart Creek have been very light and it is improbable that the take of eggs will be large. Up to December 1, 1916, 569,000 eggs had been secured.

MOUNT WHITNEY HATCHERY.

Mount Whitney hatchery, located on Oak Creek, four and a half miles from Independence, the thriving county seat of Inyo County, is nearing completion. This beautiful structure, when completed, will be the most modern and up-to-date hatchery in the world. It is constructed of granite and gabro, and the coloring of the rubble walls blending harmoniously into the background of giant peaks that form the west wall of the valley leaves an impression that will long be remembered. The work of the Department of Engineering on this structure will be completed about January 1, 1917. The hatchery equipment and apparatus necessary to handle the millions of eggs that are to be hatched at this station in the near future will be made by the employees of the hatchery department. The building is 200 feet long by 45 feet wide, and has a hatchery capacity of 6,000,000 eggs. This building is the first unit of a series of modern hatcheries and batteries that will make up this station when the whole plan is finished.

The ample supply of pure water in Oak Creek that gushes from the granite rocks of the basal slopes of the Whitney range is sufficient to furnish this plant with all the water necessary for its development for a quarter of a century.

An almost unlimited supply of eggs can be obtained from the Rae Lakes, if fishing is prohibited in these waters. To insure a supply of rainbow trout eggs for all time, the Rae Lakes basin should be set aside as a state fish preserve during the coming session of the legislature. This can be done by creating a fish and game district of the basin in which the lakes are situated and prohibiting fishing in the district set aside as a preserve. This is necessary to insure a supply of eggs for this new station. When the new trail is completed to the lakes, hundreds of anglers will rush there to enjoy the wonderful fishing that these lakes afford. There are thousands of rainbow trout in these lakes, but to furnish eggs sufficient for a station of the size of the Mount Whitney hatchery, it will be necessary to conserve these fish for spawning purposes.

The importance of Mount Whitney hatchery is best understood when it is realized that the whole of the state south

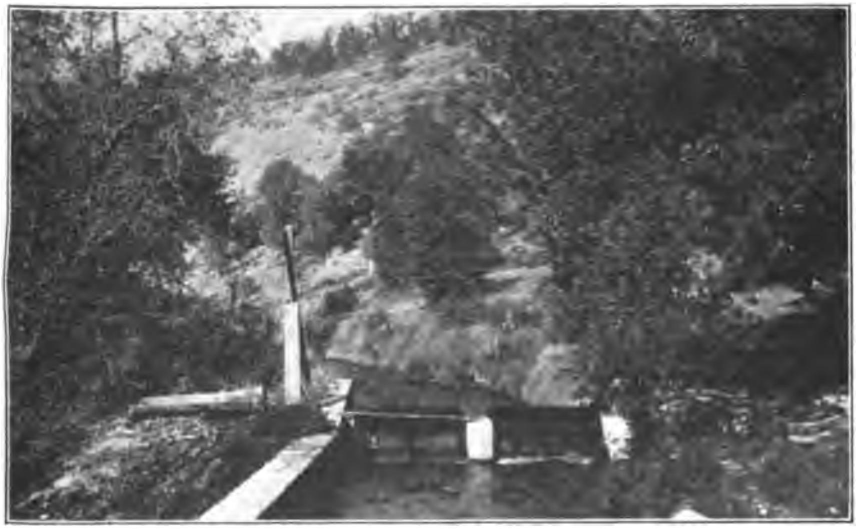


Fig. 16. Screen installed in the canal of the Northern California Power Company on the Colman Ditch from Battle Creek, Tehama County, California. The screen wheel is ten feet in diameter and the water seven feet deep. Photograph by A. E. Culver.

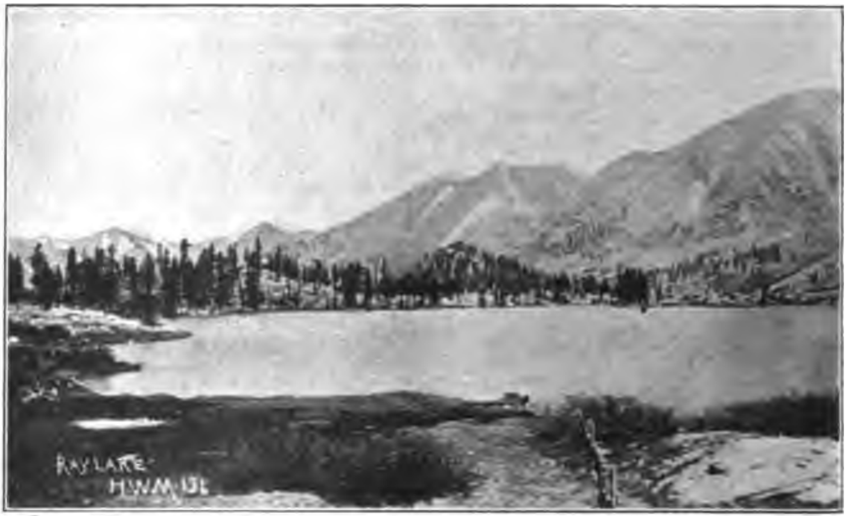


Fig. 17. A view of one of the Rae lakes. Eggs for the new Mount Whitney hatchery will be secured here.

of the Tehachapi Mountains and as far north as the Yosemite Valley will receive its annual supply of rainbow trout fry from this hatchery. Mount Whitney hatchery is not built for a day or a decade, but is planned for the coming years, as California's fame as an anglers' paradise grows. It will be able to keep stocked those streams depleted by the increasing demands made upon them as the population increases.

COMMERCIAL FISHERY NOTES.

N. B. Scofield, Editor.

THE 1916 TUNA PACK.

The 1916 tuna pack for California will exceed that of last year or of any preceding year, but with all that the year has been a disappointing one for the canners. With a strong demand for all the tuna they could put in cans, nearly all of the packers had improved or enlarged their plants, and more fishermen were employed with the intention of doubling their output if possible. Even with the incentive of a higher price the fishermen were able to take but few more fish than last year. Although the pack is a little larger this year it is certain that the fish were not nearly so plentiful. We will always be uncertain as to what the tuna catch will be, for it is a pelagic fish and its feeding ground and possibly its place of spawning shifts with the shifting currents.

Last year large albacore (tuna) were found to be plentiful far out in the open sea fifty to seventy miles southwest of San Clemente Island. On account of the great distance from the canneries it was unprofitable to go after them with the small boats now employed. This year a few larger fishing boats were built with the idea of going after these large fish, but they did not succeed in locating them.

Some of the more successful Japanese fishermen who have prospected in these off-shore regions believe that fishing "banks" will be found where albacore may be taken the year round. They also believe that the "run" of albacore is not so much a movement up the coast as it is a movement toward the coast from these off-shore banks.

There are a number of reasons for this belief. The fishermen have been unable to follow schools in any extensive movement up the coast. The fish usually appear first well off shore and later move closer in. A school of exceptionally large albacore will appear at one place and will not be taken later either to the north or to the south. In 1914 a school of very small albacore averaging four and one-half pounds in weight appeared off San Pedro. These fish were not traced either to the north or to the south of this place.

It has been demonstrated that such fish as the herring and sardine of Europe do not migrate up and down the coast as formerly supposed, but that the movement is shoreward from the open sea, and that while the herring are all of one species, each locality has a race of herring that in quality or size is peculiar to and constant in that locality. If there was a general movement along the coast the character of the fish in the different places along the coast would not be constant. The herring on our Pacific coast shows this same race difference in different localities, and it is barely possible that the albacore may be found to exhibit these race differences at different localities along our California coast.

It is of interest to know that the young of the albacore have never been observed. To our knowledge, the smallest albacore captured in California weighed three pounds. No albacore with noticeably developed spawn have been taken by any of the cannery fishermen. The ovaries and spermaries of the fish usually show no development at all and it is only rarely that one with even immature spawn is observed. The largest albacore so far recorded weighed seventy-six pounds. This one, with several others nearly as large, was taken near San Pedro during the last week of October, 1916.

There were 397 fishing boats employed in the tuna fishery this year, each boat being manned by a crew of three. Half of the tuna fishermen are Japanese and this one-half catches 85 per cent of the fish.

A YELLOW-FINNED ALBACORE FROM THE MEXICAN COAST.

A fish sent to us for identification from near Mazatlan, Mexico, has been pronounced by Dr. C. H. Gilbert the yellow-finned albacore, the albacore most common in Japan and usually called the Japanese albacore. It is found in the Hawaiian Islands and a few individuals have been taken in southern California by the fishermen while fishing for the long-finned albacore or tuna. It is reported that these fish are plentiful near Mazatlan.

MUSSELS GROW RAPIDLY.

In investigating the rate of growth of some of the sea animals in Monterey Bay, Dr. Harold Heath, Department of Zoology, Stanford University, found that the sea mussel (*Mytilus californianus*) grows from the egg to a length of three and one-half inches in one year. He found also that both the acorn and goose barnacles reach sexual maturity at the age of eighty days.

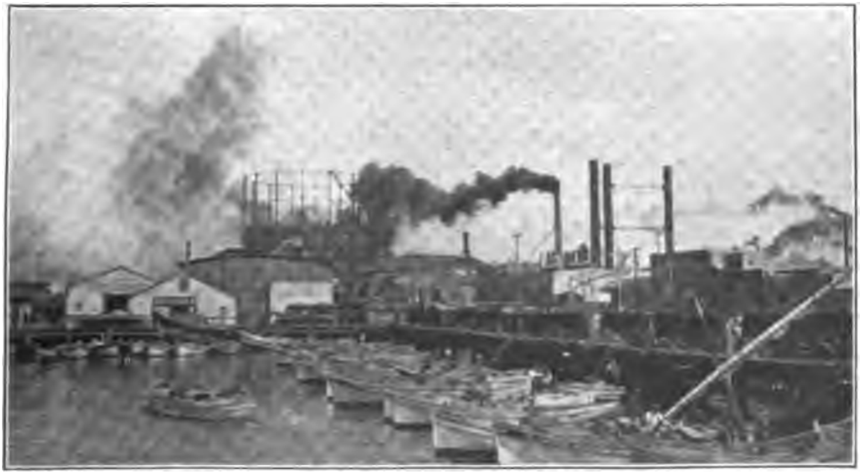


Fig. 18. Fisherman's Wharf, San Francisco. Photograph by H. H. Hunt, April 12, 1916.

A COMMERCIAL FISHERIES TAX BILL.

The Fish and Game Commission has prepared a bill, to be introduced at the next session of the legislature, which is designed to increase the revenue of the commission that it may better carry on its commercial fisheries work.

Since the legislative session of 1909, the Fish and Game Commission has received no appropriation from the state, as the revenue derived through the hunting, angling and commercial fishing licenses was deemed sufficient for all the needs of the commission. But with these funds the game patrol service has been greatly extended, the commission's activities have been increased and the output of trout from the hatcheries has been so enlarged to meet the ever-increasing demand for stocking the streams that the revenue derived from the hunting and angling licenses is all needed for these purposes. There is left then for the commercial fisheries the revenue derived from the commercial fishing licenses and the wholesale fish dealers licenses, which together amount to less than $35,000 per year. This amount is entirely inadequate to carry on an effective fisheries patrol; to propagate commercial fishes; to carry on the investigation work so necessary for the conservation of our fisheries; and to pay the fishery's proportionate share of the executive expense of the commission.

In supplying the revenue for the support of the commission, each activity under its jurisdiction should bear its proportionate share. As already stated, the commercial fisheries are not furnishing their proportionate share at the present time, and in the future expansion of the fisheries, which is already upon us, they will fall short still more.

Within the last few years our fishing industries, especially those carried on in the open sea, such as the tuna, halibut, sardine and trawl fisheries, have developed enormously. There is now a very great need of a better fisheries patrol and of a thorough investigation of the commercial fishes if we are to conserve these industries with intelligence. Some of our fisheries are bound to be developed, even without state aid, faster than we can gain the necessary knowledge for their conservation. The people will learn to eat species of fish that are now little used. Our fish are gradually being sent to more distant markets. The eastern United States is now drawing heavily on our salmon, shad, tuna and sardines, and is bound to draw more heavily on these and others of our fishes in the future. The great increase in the demand for all kinds of canned fish is another feature we must recognize if the fisheries are to be successfully regulated in the future. Our most important problem is how to get the most out of our fisheries without injuring the source of supply. In other words, to use the interest without drawing on the principal.

Our fisheries can be adequately conserved only when we have learned the life histories of the different market fishes; when we have learned the effect of the fishing methods in vogue, and when we know how much each fishery will yield without injuring the supply. This knowledge must be applied by framing such protective laws as may be necessary; by enforcing these laws by an adequate patrol service, and by aiding species by artificial propagation where that method is feasible. These are necessary steps that should be completed as soon as possible. They are steps that should be well provided for by the state before a campaign is started to further develop the fisheries. To use a revenue from the fisheries at this time for any but these purposes would be a serious mistake, and any reasonable revenue which they will yield will all be needed to carry on the conservation work now being conducted by the Fish and Game Commission.

CONSERVATION IN OTHER STATES.

PENNSYLVANIA ATTEMPTS TO RESTOCK THE STATE WITH RABBITS.

The attempt has been made by the Pennsylvania Fish and Game Commission to purchase thousands of rabbits from other states to be used in restocking. Although promised carloads of rabbits from Kentucky, none was secured because those who caught the animals put them in a box or enclosure together, with a result that but one rabbit remained the following morning, it having killed the others. An offer of thirty cents apiece f. o. b. at their shipping point also failed to secure rabbits from localities where they were said to be so abundant as to be a nuisance. Instead of tens of thousands of rabbits which it was planned to secure only about 2,500 have been obtained.

Efforts to secure quail have also failed because of the inability to purchase them at reasonable prices.

ANGLERS IN MICHIGAN WORRIED.

Anglers in Michigan are worried over the statement by Dwight Lydell, superintendent of one of the state fish hatcheries, to the effect that although more fish were planted this year than ever before, yet the lakes and streams of Michigan are in serious danger of being devastated of fish. He says: "Fishing seems to be drawing more people every year and the popular varieties of fish are being removed faster than we can plant them with the small appropriation of $80,000 allowed us by the state legislature." Approximately 90,000,000 fish were planted in Michigan this year, as follows: Trout, 6,000,000; perch, 50,000,000; blue gills, 1,000,000; bass, 3,500,000; wall-eyed pike, 25,000,000.

MINNESOTA COMMISSION MAKES USE OF MOVIES.

The Minnesota Game and Fish Department has prepared moving picture films illustrating the artificial propagation of different varieties of Minnesota fish. Films of commercial fishing scenes and bird and animal life also are being prepared. These will be loaned, on application, to responsible organizations, and talks in explanation of the pictures will be given by the commission or the superintendent of fisheries wherever possible.

BUTTON LAW FOR HUNTERS IN NEW YORK STATE.

A new New York game law, among other regulations, provides that all licensed hunters must wear, conspicuously displayed, a button, at least two inches in diameter, to be furnished by the state. In other words, the hunting license must be kept in plain sight.

LIFE HISTORY NOTES.

THE SNOWY OWL AGAIN INVADES CALIFORNIA.

It is a well-known fact that the snowy owl (*Nyctea nyctea*) is of erratic occurrence in eastern states. It now appears that this bird occurs periodically in this state also. Just twenty years ago (1896) a number of snowy owls invaded the northern part of California. Specimens were taken as far south as Bay Farm Island, Alameda County (Cohen *in* Condor 3, p. 185) and Santa Cruz County (Thompson *in* Condor 3, p. 141).

During the same year snowy owls were reported as numerous in the state of Washington (Bowles *in* Osprey 1, p. 81). According to H. G. Smith (Nidologist 3, p. 76) snowy owls were taken in the state of Colorado in 1886.

The following additional data on the occurrence of the snowy owl in California in 1896 has been furnished by H. S. Prescott of Crescent City, Del Norte County:

Ely Charter of Crescent City, Del Norte County, secured two or more specimens, in 1896. One of these was mounted and for many years was in the possession of Mr. Jeffrey, the keeper of the Crescent City lighthouse. H. J. Lattin, residing near Arcata, also saw a number of these birds in that year.

In November, 1916, a male specimen of a snowy owl, secured by Florence F. Williams on the ocean beach near the outlet of Talowa Lake, Del Norte County, was sent us by H. S. Prescott. A second specimen, a female, was secured by Mr. Prescott on November 25 between the north end of Lake Earl and the mouth of Smith River, Del Norte County. Along with this bird was a report to the effect that Ely Charter had seen nine snowy owls between Point St. George and the mouth of Talowa Lake. Two other specimens are noted as having been taken in the county in a newspaper item appearing in the Humboldt *Times* under date of November 23. Several applications for permits to hold birds in captivity have since been sent to the Fish and Game Commission by parties in the same vicinity who have secured snowy owls alive.

On November 18, through the kindness of George Neale of the Sacramento Division of the State Fish and Game Commission, we received another snowy owl, secured by Edward Bolt of Gridley, Butte County. The stomach of this bird contained parts of a mudhen.

The above is sufficient evidence to show that snowy owls have again made their appearance in California, probably for the first time since 1896. All three of the above specimens have found a place in the Museum of Vertebrate Zoology, where they will be of permanent value to the state.—H. C. BRYANT.

DUCKS ARRIVE EARLY.

Ducks arrived very early this season. Several canvasbacks were seen on San Pablo Bay August 20, 1916. Pintails were unusually abundant at this time of year, and a few bluebills were also seen. Deputy Hoen reported to me that canvasbacks were seen on Tomales Bay during the latter part of August.—H. E. FOSTER.

ONLY A FEW DUCKS DIE AT TULARE LAKE.

The fact that but few ducks have died this fall on Tulare Lake has again upset the theories regarding the peculiar malady which periodically has affected the waterfowl on this lake. If the water of the lake is responsible for the disease it seems strange that last year when the lake was the dryest it has been for some time, only a few birds were found dead. This year, with an abundance of fresh water and the lake 16 to 18 miles across, larger than it has been in years, no serious outbreak of the disease has occurred. On the other hand, in 1910 when the Kings River ran into the lake from the middle of March until the middle of October and the lake was even larger than at present, the largest death toll of any year resulted. It is to be hoped that the decrease in the number of affected birds noted during the past two years will continue and that the trouble is mainly over.—E. W. SMALLEY.

DUCK DISEASE.

The only place where duck disease has appeared in the Lower San Joaquin Valley this fall (1916) is on a small lake, formed by the overflow from Bull's Slough, on the northern border of Kern County. The lake is located just north of the old Fowler House, a landmark of the country, and is about one mile wide and three and one-half miles long. On the banks along the border of the lake I estimated there were fifty dead ducks to every one hundred feet. When visiting this section on the 21st day of July, 1916, no birds were found. Apparently, therefore, the ducks began dying some time during August.—TIPTON MATHEWS.

GAMBEL QUAIL TRANSPLANTED.

Two dozen Gambel quail (*Lophortyx gambeli*), obtained from Mr. Kenneth Hayward of Thermal, Riverside County, were liberated on Mount Rubidoux, near Riverside, the last of September. The birds were obtained under permit from the Fish and Game Commission. The transplantation was made in the hope that these desert quail would increase and add interest to Mount Rubidoux. The birds will be carefully protected and fed regularly.—J. S. LOGAN.

UNUSUAL DUCKS VISIT INTERIOR.

Several species of winter visitant ducks, which formerly were seen commonly in northern California and which are now practically unknown or unrecognized by the younger generation of waterfowl shooters, have been observed this season. Ducks of several different species have been brought to the Sacramento office of the Fish and Game Commission for identification. Three are of particular interest: the lesser scaup, or "bluebill," which, twenty-five years ago, frequented the unreclaimed islands of the lower Sacramento; the American goldeneye, and the beautiful bufflehead or "butterball." The goldeneye has even appeared in the markets in Sacramento this year. The wood duck, which nested in large numbers in the timber bordering the banks of many sloughs and rivers of central and northern California, also has been unusually common this winter.

The presence of these ducks augurs well for the future. The present federal and state laws may be responsible for the return of these species. Certain it is that it has been many years since these ducks have been seen in any numbers in this section.

Quite a number of wood ducks were seen on the opening day of the season and several were killed. Unfortunately, a duck is simply a duck to most shooters, who do not know or care what species of ducks and other waterfowl are protected at all times. Such shooters kill the bird only to learn later that it is unlawful to shoot the same. We have seen a perfectly honorable law-abiding sportsman kill a swan, supposing it to be a goose, and kill wood ducks for teal or other ducks. There is nothing more interesting to the true sportsman than knowing the species, even to the sex thereof, before shooting. No two species fly alike. Every species of duck has its peculiar mode of locomotion. Some use a slow motion of wing, some very fast, as do the quail. The short-winged ducks, such as the teal, goldeneye and ruddy, are not only recognized by their rapid flight but by a peculiar motion all their own that can not be explained or described, but which can not be forgotten when once learned. The movements of birds should be observed closely by the hunter, so that he may tell at a glance what species he is about to kill. The wood duck (which is protected all the year) is one of the easiest of ducks to distinguish, both by flight and plumage. This duck, especially the female, appears to have small spectacle rims on each side of the head, a mark very plainly discernible. Both have plumes on the crown, the male plume being larger than that of the female. The female, when flying, invariably has a peculiar cry as though it were in pain.

More study of the bird and less thought of how many birds one can kill will prove interesting, and, furthermore, will mean the saving of some of the species from extinction. If hunters persist in shooting everything, irrespective of kind, arrest and severe punishment will be used to compel them to have more care.—George Neale.

THE MOUNTAIN LION AN ENEMY OF THE SKUNK.

The following evidence bears on the food habits of the mountain lion. Evidently lions do not confine their attention wholly to deer.

On November 8, 1916, our shepherd dog treed a young California lion a short distance below our ranch, near Coulterville, Mariposa County, California. My father, on approaching the lion, which had taken refuge in a live oak tree, noted an odor of skunk. After the lion had been killed the stomach was found to contain a half-chewed skunk, a striped one, judging from the black and white hair found. The lion was only a small one, weighing in the neighborhood of thirty-five pounds.—Donald D. McLean.

UNITED STATES FOREST SERVICE COOPERATION.

L. H. Whiteman, Editor.

QUAIL BECOMING SCARCER IN THE STANISLAUS NATIONAL FOREST.

Mountain and valley quail are getting scarce, valley quail being found in large numbers only in the southern portion of the Stanislaus National Forest. This is probably due to the increased number of hunters who go into the forest each year, and to the use of modern firearms. Also it is a well known fact that hawks get away with a large number of birds, especially in the high country. It is believed here that the mountain quail law should open with that for valley quail, since in some districts the young birds are hardly able to fly on September 1, when the present season opens.—E. D. Bach.

DEER IN THE EL DORADO NATIONAL FOREST.

Forest officers reported 128 deer killed during the 1915 open season within the El Dorado National Forest, and five without the forest, or a total of 133 reported by forest officers who are deputy fish and game commissioners. This number does not equal the number killed during the open season of 1914, which is a strong argument that deer are decreasing in number, and there were many more hunters in the mountains this season than during 1914. A rapid increase in the number of hunters may be expected in the future for the reason that the automobile furnishes rapid transportation to and from the valley towns. It is recommended, therefore, that deer be further protected by allowing only one buck per man per season, and if in one or two years a slight increase in the number of deer is not seen, a closed season for at least three years should be enacted.—E. L. Scott.

EFFECT OF FOREST FIRES ON FISH.

In the summer of 1915 a very severe brush fire burned off all the brush cover along the headwaters of Tepusquet Creek in the Santa Barbara National Forest. Tepusquet Creek had good fishing in it before the rains came, but the rains that winter poured tons of dirt and ashes off the burned mountain sides into the creek, gullying the slopes badly. The fish holes were all filled up. The dirt and ashes evidently killed every one of the fish. Now the stream has not a fish in it, or any holes for them to live in during the summer if there were any alive.—J. R. Hall.

FOREST OFFICERS DESTROY PREDATORY ANIMALS.

More proof of the value of forest officers as protectors of game is found in a recent report from the Sequoia National Forest which states that two bears, thirty coyotes and five wildcats have been killed during the past year by forest officers.

THE SPIKED BUCK LAW.

The spiked buck law comes in for a good deal of comment from rangers of the Santa Barbara National Forest, as follows:

The spiked buck law is a good one: First, because the bucks are getting very scarce; second, because it causes the hunter to look closer at the deer before shooting, therefore preventing the killing of many does for lack of close observation.—Ranger S. H. Douglas.

The spiked buck law is a good thing in the right direction, and I believe has been universally observed; in fact, there have been very few reports of violations and in every case except one I have reason to doubt the truth of the reports, and I have investigated every report reaching me. The reported violations proved to be some one's suspicions. The presence of plenty of does and fawns and spiked bucks throughout the district is evidence of the integrity of the great majority of the hunters who have been in the field.

I have found a growing sentiment during the last several years in favor of a closed season of from three to five years in length and then a reduction of the buck limit—one buck and the season shortened anywhere down to one day. The sentiment in favor of a closed season has crystallized until I have heard almost every hunter that I have met this season make some such expression.—Ranger H. H. Hunt.

My idea of the spiked buck law is that it is all O. K.; saves more does than any law ever passed. The opening and closing of the season could not be better. The trout season is all right just as it is and the quail season also.—Ranger S. J. Rhyne.

BOY SCOUT COOPERATION.

NEW YORK SCOUTS TOLD HOW TO CONSERVE WILD LIFE.

[The following is the advice given the boy scouts of New York State by John B. Burnham, president of the American Game Protective Association. Scouts of California! Can't you make use of some of these ideas? What birds mentioned by Mr. Burnham are not found in California? Honorable mention will be given the California scout who sends in a correct list.—Editor.]

CONSERVATION AND WILD LIFE.

Conservation is preservation. It is founded on frugality and unselfishness. As applied to game and forests it does not mean that game shall not be killed nor trees cut down when needed for use, but it does mean that there shall be no wanton destruction and no unnecessary waste.

Only useful things must be taken as required, and then only when not in conflict with the right of others. Beautiful objects in nature must be spared and protected. Birch trees must not be marred by peeling the bark. Shrubs and trees must not be hacked and defaced. Names or signs must not be chiseled on rocks. Above all, beautiful and useful birds and mammals, not classed as game, must be protected with the same spirit with which we protect our own good names.

Our natural resources are given us "in trust, for the benefit both of the present and the future. We must render an accounting of the trust to those who come after us!"

CERTAIN CARDINAL PRINCIPLES.

1. Way back in Deuteronomy we are told not to molest a bird on the nest. This is the earliest game law and the most fundamental. All creatures must be protected during the period of rearing their young. Otherwise extermination will result.

2. Do not let anybody rob bird nests. Protect the immature things from predatory creatures. If you have a cat which kills birds, put a bell on its neck and do not let it roam the fields, particularly in the nesting season.

3. Do not be a game or fish hog, and do not let others take more than a reasonable or legal limit. Sometimes the legal limits are too large, and sometimes there are no legal limits imposed. Here your moral powers should be exercised to prevent excess. Supplant the fallacy that nothing succeeds like success with the finer principle of sport for sport's sake. Taking game and fish with gun and rod in moderation is manly sport, but it is still finer to study the wild things and to secure as trophies photographs which are tokens of greater skill in woodcraft.

4. It is now illegal to sell almost every kind of game in almost every state in the Union. New York prohibits the sale of all game except rabbits and certain propagated and imported species. The market hunter is thus eliminated, but in some places game is still illegally sold by resort to subterfuge.

5. You can do much to preserve the game and birds by providing cover for them and food. Plant barren tracts with trees which can be procured from the Conservation Commission for three or four dollars a thousand. Plant also barberries and haws and other food-bearing shrubs which can be procured at small cost from commercial nurseries, or plant even cherry stones and apple seeds and willow suckers. You will have the satisfaction of seeing something grow where nothing grew before, and the knowledge that you have done something of value to posterity.

6. Many birds and animals die in cold weather from temporary causes. Often they need only a trifle of food to supply their needs till the snow settles, or the ice melts from seed-bearing weeds and shrubs. Here much good can be done by distributing suitable grains or other food in the swamps or other places in which wild life resorts. Read "Wild Bird Guests" and other books which give information on this subject.

7. Know the game laws. Remember that all wild birds in the state are protected at all times, together with their eggs and nests, except English sparrows, starlings, crows, hawks, crow blackbirds, snow-owls, great-horned owls and kingfishers, and the game birds.

The birds classed as game are limited in number in this state and it is an easy matter to learn the list. They are the waterfowl, including geese, brant and river and sea ducks; the marsh birds, including rails, coots, mudhens, and gallinules; the upland game birds, including grouse or partridge, pheasants and quail; and the shore birds, such as woodcock, snipe and plover. Knowing the birds which may be killed, it is easy to be sure of those which may not be killed and, thus informed, to prevent others from taking the lives of those cheery and useful friends of humanity. To know when game birds are being killed illegally, however, it will be necessary to study the state closed seasons.

A SAMPLE OF THE WORK OF ONE SCOUT.

[Here is a sample of the interest taken by one Scout. Scout Marriott is out after that prize and the rest of you will have to hurry.—EDITOR.]

SANTA MARIA, CALIFORNIA,
October 26, 1916.

State Fish and Game Commission of California.

DEAR SIRS: In regard to your game magazine, of which we received a copy, I notice it speaks chiefly about deer and I will tell you a few more things we find to be true.

One reason why our deer are lessening in number is because some of our citizens kill deer before the season opens, kill does and fawns whenever no one is around that they know of and many kill more than two a season. This can easily be done, we find, by the hunter killing one, then after that is gone and if he has not been noticed by some ranger or game warden, he will throw the horns and skin away and go after his two deer which he says he has a right to kill. This is often used, I fear, and something should be done to stop it.

Another solid reason why our deer are few in numbers is because of the puma or mountain lion, which preys upon the deer. These beasts, I and many others find, kill on an average of ten per year, and a bounty of about $100 ought to be paid for the skin of a lion. There is only one good thing that the puma is good for and that is his fur; therefore, it would do no harm if they were entirely exterminated.

Yours truly,

(Signed) PAUL MARRIOTT.

SANTA MARIA, CALIFORNIA,
September 4, 1916.

State Fish and Game Commission,
Los Angeles, California.

To whom it may concern:

On your game laws (1915–1917), I find you have the dove season opening on September first.

This opening season date for doves I find does not give the parent birds time enough to hatch their young.

A week ago I was on a little hike by myself. I discovered three dove nests, one with eggs and the other two with baby doves about a week old in them. As this is a fine dove country there must be many more nests with the same aged occupants.

Yours truly,

PAUL MARRIOTT.
Tenderfoot Scout, Troop 1.

SANTA MARIA, CALIFORNIA.
October —, 1916.

State Fish and Game Commission
of California.

To whom it may concern:

In regard to the English sparrow or European house bird I find that in this district the bird nests from four to seven times a year and usually has from four to six eggs.

Its nest is very poorly constructed, and as it builds in some corner, nook or ornamental fixtures, it not only spoils the appearance of the building but has often caused fires.

In the fruit counties this bird nips the buds in spring, kills young birds of the song variety and fills air with its non-musical chirp. There seems to be only one bird that can hold its own with the English sparrow and that is the blackbird.

We have great difficulty in planting lawns here because as soon as the seeds are sown the pests arrive and they soon leave patches of bare ground.

I have built a nest box in my yard and the best way I find to exterminate them is to let them nest, then one by one break up the eggs. In this way the birds soon leave the nest and the box is soon filled by another couple which by the same way may be gotten rid of. Instead of taking them all at one time the parent birds can be caught and killed and the eggs also destroyed.

I have killed fourteen English sparrows since the troop received your letter.

If there is some better way of getting rid of them or anything else I can do for the Fish and Game Commission please let me know as I would like very much to have the honor of getting a pair of pheasants.

Yours truly,

PAUL MARRIOTT.
Tenderfoot Scout, Troop 1.

CALIFORNIA FISHERY PRODUCTS FOR THREE MONTHS ENDING JUNE 30, 1916.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Sacramento, San Joaquin	Alameda, Contra Costa	Solano, Yolo	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Other counties	Mexico	Total
Albacore											404,653		1,335			405,988
Anchovy			98,775		825		2,771		21,780		9.443					133,594
Barracuda								347		56,900	717,484	13,987	306,903		164,059	1,259,580
Bonito																
Bocaccio							4,331		47,493							51,824
Bluefish																
Chilipepper									17,561							17,561
Carp			2,915	4,454	20,357	30,780	36,036							1,748		96,260
Catfish		3,077			35,190	15,347								525		54,139
Coalfish									1,771							1,771
Cultus cod							35,385	40,098								75,483
Dogfish									9,722							9,722
Flounder	2,204				14,646	962	95,896	91								113,799
Halibut	4,085		127				1,278	6,787	4,066	15,000	586,850	14,098	18,678		271,508	916,376
Hake							35,446	450	146		140					36,182
Herring			628,427		1,575		7,106	870	41,283		3,229					682,490
Kingfish							26,760	59,090			95,072	262	2,589		525	184.218
Mackerel									583		182,104				970	183,657
Mullet																
Pike				1,391	329									105		1,825
Pompano							246	1,167	117		5,797	155				7,482
Perch	1,650		8.759		943		2,680	8,587	6,326		2,370				260	26,480
Rock bass		833									64,537	12,278	161,232		34,970	273,850
Rockfish	1,660		29,984				108,437	22,602	200,770	6,805	298,891	4,886	235,152		39,509	948,646
Sole							484,835	406,287	7,972		1,969		485		225	901,773
Salmon	8,776	1,200	118	150,742	264,250	370,659	1,984	81,052	3,323,837		55			15,265		4,217,938
Smelt	11,436		8,904		2,348		125,972	10,761	35.086	16,580	39,615	2,353	5,991		340	259,386
Sea bass (white)			167					104	250	6.971	63.306	146	7,234		10,577	88,588
Sea bass (black)											5,158		7,631		3,525	16,314
Sand dab							213,084	155,600	1.296		5.357	28				375,365
Striped bass			429	32,797	33,717	61,421	84,580	222						128		263,244
Shad				86,669	2,896,418	809,125	94.147	68						10,760		3,897,187

CALIFORNIA FISHERY PRODUCTS FOR THREE MONTHS ENDING JUNE 30, 1916—Continued.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Sacramento, San Joaquin	Alameda, Contra Costa	Solano, Yolo	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Other counties	Mexico	Total
Sturgeon	120			1,390	1,988	728	100							179		4,505
Sardine	45						1,198	202	231,968		17,530		136,667		145	387,755
Skate							25,927				283	75				26,285
Sculpin								70			1,029	172				1,271
Sea trout											538	10				548
Tom cod							5,118									5,118
Trout (lake)													1,610			1,610
Turbot			21													21
Whitebait		35	6,745				58,547									65,327
Yellowtail											268,076	221	27,554		8,055	303,906
Miscellaneous	5,248	400	273,450	491	275		10,481	296	6,509		22,961	14	1,285	18		321,825
Total fish	35,219	5,545	1,058,775	277,984	3,327,860	1,288,992	1,452,195	789,458	3,967,506	102,256	2,796,376	48,685	909,241	28,728	584,663	16,613,578
Crustaceans																
Crab (dozen)	2,354						6,127	6,100	968							15,549
Spiny lobster															160,585	160,585
Shrimp							99,267									99,267
Ecrevisse		1,740														1,740
Mollusks—																
Squid									59,127		5,482					64,609
Cuttlefish							237	6,102	1,522							7,861
Clam (Pismo)								3,693		41,853						45,546
Clam (cockle)		574	25,559							895	3,976	1,556				32,040
Clam (softshell)		5,382	183,460		31,801		7,144									227,787
Clam (mixed)	6,200	1,695	1,624					75	60		1,468					11,122
Oyster (shell), No.							2,474,855									2,474,855
Abalones		4,100						1,201	180,764	164,364						350,429
Mussels		85	397				367		186	1,283	5,880					8,198
California oysters			5,845													5,845

N.B.—The figures denote pounds, except where otherwise stated. Salmon, codfish, and whale products from distant waters, brought in by boats operating out of California ports, while rightly belonging to California fishing products, are not included in the table.

CALIFORNIA FISHERY PRODUCTS FOR THREE MONTHS ENDING SEPTEMBER 30, 1916.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Other counties	Mexico	Total
Albacore											4,125,710	132	3,488,972			7,614,814
Anchovy			84,460				21,800		54,700		21,975					182,935
Barracuda								10		24,889	34,670	6,832	25,871		14,450	106,722
Bonito									33,521		119,621		81,116			234,258
Bocaccio							120	1,730								1,850
Bluefish																
Chilipepper								1,837	3,603							5,440
Carp				1,000		24,587	5,678							3,117		34,382
Catfish		97			7,610	1,550										9,257
Coalfish								1,660	4,545		415					6,620
Cultus cod	1,222						36,275	27,002	11,156	261	62					75,978
Dogfish			4,245								325		118			4,688
Flounder	707						72,290				405	7				73,409
Halibut	38,204		101				1,358	2,191	10,387	7,602	219,029		215		773,676	1,052,763
Hake							21,700	6,550			15,815	7,654				61,719
Herring									2,125		270					2,395
Kingfish							36,207	18,960	62,277	22	44,378	159	1,318			163,321
Mackerel									3,904	10,005	285,513	1,473	4,033			304,928
Mullet								60					205	9,202		9,467
Pike					75	736										811
Pompano							60	894	19		1,300		29			2,302
Perch		7	3,556				1,063	2,467	630		1,265	30				9,018
Rock bass										15,835	231,159	4,573	137,558			389,125
Rockfish	3,906	963	555				227,721	76,460	249,432	27,445	240,174	2,536	13,079			842,271
Sole							582,526	620,716	8,531	20	2,310		60			1,214,163
Salmon	129,553	1,849	2,806	464,038	193,003	667,682	234,727	67,169	1,255,689	80						3,016,596
Smelt	9,784	90	4,834			50	77,127	23,174	36,237	24,056	40,907	9,050	8,925			234,234
Sea bass (white)			18,941			635	96,700		30,153	5,896	80,358	96	1,391		218,797	452,966
Sea bass (black)											5,746		20,349			26,095
Sand dab							228,030	299,940	8,060	4,680	5,823	597				547,130
Striped bass		1,798	52	8,641	1,318	37,484	91,197	106						196		140,792
Shad				6,580	12,780	51,980	2,760	28						1,393		75,521
Sturgeon	525				171	650	278									1,624

CALIFORNIA FISHERY PRODUCTS FOR THREE MONTHS ENDING SEPTEMBER 30, 1916—Continued.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Other counties	Mexico	Total
Sardine			5,158				2,010	16,849	3,757,686	1,265	18,675		4,868			3,806,006
Skate							14,130									14,130
Sculpin											787					787
Sea trout											684					684
Tom cod							12,987									12,987
Trout (lake)														67,273		67,273
Turbot			409													409
Whitebait			15,196				38,759			235	182,552					236,742
Yellowtail										8,569	18,066		112,078			138,708
Miscellaneous	1,708	910	32,945	175	18		17,506		3,444			198	1,144	20		58,068
Total fish	185,604	5,714	173,238	480,484	214,975	785,854	1,832,959	1,167,308	5,586,099	125,860	5,697,894	33,387	3,841,834	81,300	1,006,923	21,278,689
Crustaceans—																
Crab (dozen)	547	6					2,291	768								3,609
Spiny lobster															121,265	121,265
Shrimp							127,927									127,927
Ecrevisse		492														492
Mollusks—																
Squid			125				108	225	109,956		105					110,519
Cuttlefish							2,718	184	121							2,968
Clam (Pismo)										51,671						51,671
Clam (cockle)		460	10,589								7,102					18,151
Clam (softshell)		2,080	49,708			48,978		5,855								101,551
Clam (mixed)	6,040	560	2,500			106	1,350			50						10,606
Oyster (shell), No.							3,234,845									3,234,845
Abalones								500	187,634	1,392						189,526
Mussels		310	165				4,409			1,242	7,120					13,246
California oysters			6,004													6,004

N.B.—The figures denote pounds, except where otherwise stated. Salmon, codfish, and whale products from distant waters, brought in by boats operating out of California ports, while rightly belonging to California fishing products, are not included in the table.

VIOLATIONS OF THE FISH AND GAME LAWS.

September 1, 1916, to November 30, 1916.

Offense	Number of arrests	Fines imposed
Game.		
Hunting without licenses	39	$555 00
Deer, close season—killing or possession; excess bag limit one season	17	365 00
Female deer, spiked bucks, killing or possession; not retaining horns of deer; illegal deer hides	13	550 00
Nongame birds, killing or possession	17	185 00
Ducks, close season—killing or possession; excess bag limit	23	1,125 00
Shooting ducks from power boat in motion	9	75 00
Using a live or imitation animal blind	5	125 00
Night shooting	12	215 00
Geese, excess bag limit	1	----------
Grouse, close season—killing or possession	1	40 00
Shore birds, close season—killing or possession; offering for sale	15	215 00
Quail, close season—killing or possession; excess bag limit, trapping without permit, shipping in concealed package	5	175 00
Cottontails, close season—killing or possession	2	50 00
Total game violations	159	$3,675 00
Fish.		
Angling without a license	7	$125 00
Fishing for profit without a license	18	175 00
Striped bass—underweight	5	145 00
Dried California shrimp in possession	1	----------
Illegal fishing apparatus	9	20 00
Spot-fin croakers, buying and selling	2	40 00
Trout, excess limit, undersized offered for sale	8	25 00
Catfish, undersized offered for sale	1	12 00
Young of fish, taking or possession	3	20 00
Crabs, close season—taking or possession	4	25 00
Clams, undersize	1	25 00
Abalones, undersize	3	40 00
Lobsters, undersize and oversize	5	90 00
Taking fish within 50 feet of fishway	1	----------
Total fish violations	68	$742 00
Grand total fish and game violations	222	$4,417 00

SEIZURES—FISH, GAME AND ILLEGALLY USED FISHING APPARATUS.

September 1, 1916, to November 30, 1916.

Game.	
Deer meat	333¼ pounds
Hides	9
Ducks	4,278
Geese	1,158
Quail	173
Doves	8
Shore birds	6
Nongame birds	5
Rabbits	26
Fish.	
Striped bass	525½ pounds
Trout	48½ pounds
Dried California shrimp	4,160 pounds
Spot-fin croakers	1,435 pounds
Crabs	632
Clams	100
Lobsters	55
Abalones	83
Miscellaneous fish	8¾ pounds
Illegal nets	10
Searches.	
Illegal fish and game	111

STATEMENT OF EXPENDITURES FOR THE MONTHS OF JULY, AUGUST AND SEPTEMBER, 1916.

General administration	July	August	September
General Administration—			
General administration	$1,884 44	$2,111 26	$2,398 78
Research, publicity and education	194 70	376 71	219 59
Printing	178 01	731 73	379 47
Fish exhibits	219 10	235 00	679 21
Game exhibits	----------	12 90	165 11
Game farm	279 36	385 31	199 02
Mountain lion bounties	180 00	320 00	280 00
Lithographing hunting licenses	----------	21 00	----------
Lithographing anglers' licenses	----------	----------	7 50
Hunting license commissions and refunds	1,101 80	522 00	2,451 00
Angler's license commissions and refunds	1,631 70	348 20	1,028 90
Market fishing license commissions and refds.	33 50	59 00	23 50
	$5,702 61	$5,123 11	$7,832 08
Patrol—			
San Francisco District	$5,558 33	$5,739 59	$5,718 82
Sacramento District	4,611 98	4,098 96	3,652 76
Los Angeles District	1,867 80	1,870 40	2,113 86
Launch patrol	817 35	824 67	980 01
Prosecutions—fish and game	129 47	93 80	71 70
Crawfish inspection	100 00	100 00	100 00
Winter game feeding	----------	----------	----------
Accident and death claims	----------	7 00	----------
	$13,084 93	$12,734 42	$12,687 15
Department of Fish-culture—			
Hatchery administration	$919 27	$799 50	$785 76
Mount Shasta Hatchery	2,407 03	2,375 70	3,253 72
Mount Shasta Auxiliary Stations	----------	----------	29 05
Mount Whitney Hatchery	1,110 11	283 67	224 01
Mount Whitney Auxiliary Stations	186 85	503 27	643 50
Tahoe Hatcheries	374 74	396 19	256 16
Tahoe Hatcheries Auxiliary Stations	----------	----------	----------
Marlett-Carson Hatchery	31 40	52 73	9 20
Fort Seward Hatchery	490 96	520 33	474 52
Ukiah Hatchery	175 43	----------	----------
Snow Mountain Station	----------	26 69	99 40
Brookdale Hatchery	249 21	25 39	----------
Scotts Creek Station	31 00	31 00	30 00
Almanor Station	149 74	167 77	805 24
Bear Valley Hatchery	177 75	250 00	69 87
Yuba City Shad Station	----------	986 35	5 00
Fish distribution	2,916 90	1,410 38	1,431 54
Fish transplanting	182 19	397 10	229 50
Screen, fishway, water pollution	654 88	610 82	536 75
	$10,057 46	$8,836 89	$8,883 22
Commercial Fisheries, Research and Patrol—			
Fishery research and patrol	$509 63	$433 75	$378 92
Grand totals	$29,354 63	$27,128 17	$29,731 37

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CALIFORNIA FISHERY PRODUCTS FOR THREE MONTHS ENDING JUNE 30, 1916—Continued.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Sacramento, San Joaquin	Alameda, Contra Costa	Solano, Yolo	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Other counties	Mexico	Total
Sturgeon	120			1,390	1,988	728	100							179		4,505
Sardine	45						1,198	202	231,968		17,530		136,667		145	387,755
Skate							25,927				283	75				26,285
Sculpin								70			1,029	172				1,271
Sea trout											538	10				548
Tom cod							5,118									5,118
Trout (lake)													1,610			1,610
Turbot			21													21
Whitebait		35	6,745				58,547									65,327
Yellowtail											268,076	221	27,554		8,055	303,906
Miscellaneous	5,248	400	278,450	491	275		10,481	298	6,509		22,961	14	1,235	18		321,325
Total fish	35,219	5,545	1,058,775	277,984	3,327,860	1,288,992	1,452,195	789,858	3,967,506	102,256	2,796,376	48,685	909,241	28,728	584,663	16,618,578
Crustaceans																
Crab (dozen)	2,354						6,127	6,100	968							15,549
Spiny lobster															160,585	160,585
Shrimp							99,267									99,267
Ecrevisse		1,740														1,740
Mollusks—																
Squid									59,127		5,482					64,609
Cuttlefish							287	6,102	1,522							7,911
Clam (Pismo)								3,693		41,853						45,546
Clam (cockle)		574	25,559							375	3,976	1,556				32,040
Clam (softshell)		5,382	183,460		31,801		7,144									227,787
Clam (mixed)	6,200	1,695	1,624					75	60		1,468					11,122
Oyster (shell), No.							2,474,355									2,474,355
Abalones		4,180						1,901	180,764	164,384						350,429
Mussels		85	397				367		186	1,283	5,880					8,198
California oysters			5,845													5,845

N.B.—The figures denote pounds, except where otherwise stated. Salmon, codfish, and whale products from distant waters, brought in by boats operating out of California ports, while rightly belonging to California fishing products, are not included in the table.

CALIFORNIA FISHERY PRODUCTS FOR THREE MONTHS ENDING SEPTEMBER 30, 1916.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Alameda, Contra Costa	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Other counties	Mexico	Total
Albacore											4,125,710	182	3,488,972			7,614,814
Anchovy			84,460				21,800		54,700		21,975					182,935
Barracuda								10		24,889	34,670	6,832	25,871		14,450	106,722
Bonito									33,521		119,621		81,116			234,258
Bocaccio							120	1,730								1,850
Bluefish																
Chilipepper								1,837	3,603							5,440
Carp				1,000		24,587	5,678							3,117		34,382
Catfish		97			7,610	1,550										9,257
Coalfish								1,660	4,545		415					6,620
Cultus cod	1,222						36,275	27,002	11,156	261	62					75,978
Dogfish			4,245								325		118			4,688
Flounder	707						72,290				405	7				73,409
Halibut	88,204		101				1,358	2,191	10,387	7,602	219,029		215		778,676	1,052,768
Hake							31,700	6,550			15,815	7,654				61,719
Herring									2,125		270					2,395
Kingfish							36,207	18,960	62,277	22	44,378	159	1,818			163,821
Mackerel									3,904	10,005	285,513	1,473	4,083			304,978
Mullet								60					205	9,202		9,467
Pike					75	736										811
Pompano							60	894	19		1,800		29			2,802
Perch		7	3,556				1,063	2,467	630		1,265	30				9,018
Rock bass										15 835	231.159	4,573	137,558			389,125
Rockfish	3,906	963	555				227,721	76,460	249,432	27,445	240,174	2,536	13,079			842,271
Sole							582,526	620,716	8,531	20	2,310		60			1,214,163
Salmon	129,553	1,849	2.806	464,088	193,008	667,682	234,727	67,169	1,255.689	30						3,016,596
Smelt	9,784	90	4,834			50	77,127	23,174	36,237	24,056	40,907	9,050	8,925			234,234
Sea bass (white)			18,941			635	96,700		30,153	5,896	80,358	96	1,391		218,797	452,966
Sea bass (black)											5,746		20,349			26,095
Sand dab							228,080	299,940	8,060	4,680	5,823	597				547,180
Striped bass		1,798	52	8,641	1,318	37,484	91,197	106						196		140,792
Shad				6,580	12,780	51,980	2,760	28						1,393		75,521
Sturgeon	525				171	650	278									1,624